A COMPARATIVE FACTORIAL ECOLOGY: KUWAIT CITY, KUWAIT; AND JACKSONVILLE, FLORIDA

BY

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The objective of this study is to identify the major dimensions of the residential structure in a non-Western city, Kuwait, and compare them with the residential structure of a Western city, Jacksonville, Florida. To do this, the factorial ecology approach was used.

Several models were identified from the factorial ecology literature: the North American model which applies to the United States and Canadian cities; the European model which applies to all of Europe outside Britain; the British model; the Australian model; and the non-Western cities model which applies to the rest of the world. Kuwait City was assumed to belong to the non-Western cities model, and Jacksonville to the North American model.

Three major hypotheses are presented in the form of three questions. Hypothesis I is: how the residential structure of Kuwait City represents the model of the non-Western city, and how the residential structure of Jacksonville represents the model of a Western city. Hypothesis II is: how different the residential structure of Kuwait City is from the Western City model represented by Jacksonville. Hypothesis III is: what are the general dimensions of the residential structure in an originally non-Western society which is applying the development methods used in Western societies, and what are the spatial patterns of each dimension.

To extract the major dimensions, factor analysis was used. Forty variables reflecting population characteristics in Kuwait City, and 45 variables reflecting population and housing characteristics in Jacksonville have produced five dimensions in each city.

The results of the analysis showed that for Hypothesis I the factorial ecology of Kuwait City conforms to the general character of the non-Western city. Jacksonville showed a strong tendency toward revealing the major characteristics of the North American model. For Hypothesis II, it was found that Kuwait City strongly reflects the traditional residential structure of non-Western cities since, in these cities, it is hard to find a separation among the

major components of the factorial ecology models. For Hypothesis III, the major factors in Kuwait City showed the influence of socio-economic and ethnicity variables on the pattern of residential differentiations. In Jacksonville, there were, as expected, separated factors. There were two factors relating to socio-economic conditions, two factors relating to family characteristics, one factor relating to housing characteristics, and three additional factors relating to ethnic conditions.

CHAPTER I
INTRODUCTION

Urban geographical research has had a major change in emphasis recently. This involved a change from the description of the morphological structure and economic functions of towns toward the study of the social qualities of urban life and organization. Herbert and Smith (1979) outlined the impact of such a change as having two distinct implications for urban geography. One is methodological, represented by the shift toward the nomothetic approach and model building vis a vis the earlier descriptive approach which emphasized the unique features of each city. The second implication is philosophical, represented by a change in the application of urban geographical research. This change began to examine problems more familiar to the experience of people, and with direct relevance to the geographical aspects of problems faced by urban societies. Figure 1 provides an outline to the development of this emphasis in urban geography.

The literature dealing with the internal structure of cities in recent years is identified by a trend toward specialization in one of three broad types of geographic structures: residential, commercial and industrial. The objective of this study is to identify the major dimensions

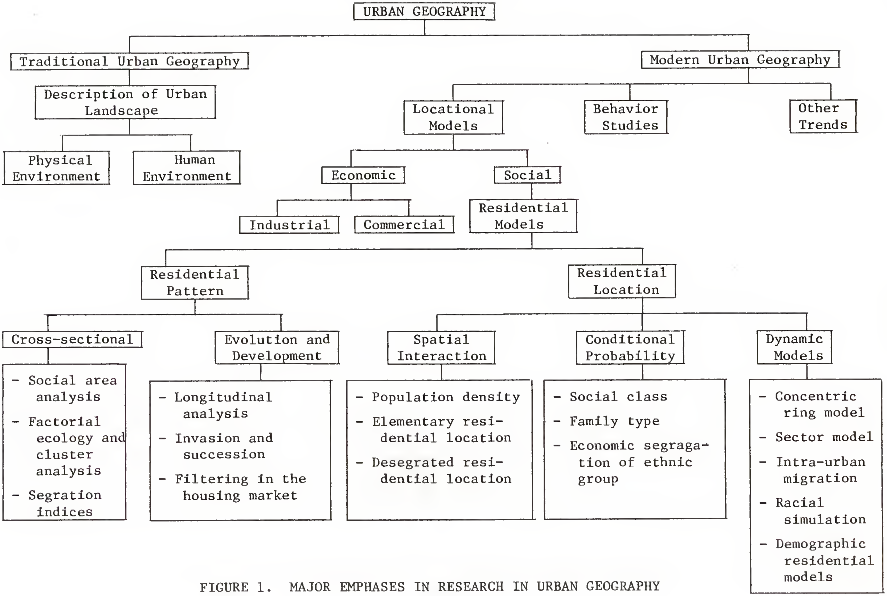

FIGURE 1. MAJOR EMPHASES IN RESEARCH IN URBAN GEOGRAPHY

of the residential structure in a non-western city, Kuwait, and compare them with the residential structure of a western city, Jacksonville, Florida.

Herbert and Johnston (1978) identify two major approaches to the study of residential differentiation. First is the subjective cognitive map approach where the major dimensions revolve around concepts like "reputation," "responsibility," "security," "beauty," and "harmony with nature." The proponents of the subjective approach to the study of residential differentiation are able to point out that humans act in terms of the environment as perceived and subjectively interpreted, not in terms of an external "objective" environment.

Second is the factorial ecology approach, in which the major dimensions revolve around social rank, family life cycle, and ethnicity. According to Herbert and Johnston (1978):

> In practice, residential location is likely to be more affected by the constraints of the urban system than it is by the preferences and cognitive maps of urban dwellers. Residential mobility is frequently forced rather than voluntary, and the opportunities which are available are restricted by costs, by knowledge, and by social access. (Herbert and Johnston, 1978, 35-36)

Rees (1979) summarizes the study of residential patterns as two types:

(a) residential pattern studies; and

(b) residential location models.

Each of these two types is divided into several subgroups as shown in Figure 1.

Residential Pattern Studies

In the residential pattern subgroup, two major types of studies can be identified. First are studies of cross-sectional structure which include studies in the fields of social area analysis, factorial ecology and cluster analysis, and segregation indices. Second, studies of the evolution and development of urban structure have been done. These studies include longitudinal analyses, invasion and succession, and filtering in the housing market.

Residential Location Models

These models are in three subgroups of research. In the first subgroup are those of spatial interaction such as population density, residential location, and models on desegregated residential location. The second subgroup includes models of conditional probability such as social class, family type, and economic segregation of ethnic groups. The third subgroup incorporates dynamic models (that is, models that change over space and time) such as the concentric ring and urban growth models, sector and urban growth models, and racial simulation and demographic residential models.

These models, outlined by Rees (1979), are not mutually exclusive. They interact on many occasions. This study will use the factorial ecology approach to identify major residential structures of Kuwait City and Jacksonville. Concepts from other models in Rees' outline will be required on several occasions.

One point to make here is the existence of several problems of terminology. A few will be mentioned here; several will be explained as they appear.

The term "Middle East" is one of the most difficult terms to define. Since it will be used in this study on several occasions, it is defined here to encompass all of the geographic area from Morocco to Iran, including all of North Africa and Southwest Asia.

A second term is the "Persian Gulf" which is recognized by all Arab states as the "Arabian Gulf." In this study the second term will be used since it is the term used in most of the government documents and other publications to which this study refers.

A third term to define is "Kuwait," which could mean the city or the country. Because there will be several references to both the city and the country, and to avoid confusion, the name "City" will follow Kuwait when discussing the city.

Kuwait City is chosen for testing the models of factorial ecology and residential structure of a non-Western city in general, and an Arab and Middle-Eastern city in particular, for the following reasons. Kuwait is one of the few countries in the Middle East where detailed and recent figures on most socio-economic characteristics are not classified. Moreover, Kuwait City could be used as an example of changes in residential structure and pattern of growth and development in the region. In addition, Kuwait City reflects the effects of a modern source of income--oil--on the traditional life in the region.

A Western city in general, and Jacksonville, Florida, in particular, was chosen for comparison because it would assure a control of the variables and method of analysis used. Moreover, the two cities have about the same population and have similar locational characteristics. Both cities are important regional ports with long-distance trade to different parts of the world. Both cities provide military services, and both cities have a relatively large sector in financial services.

Chapter II contains a discussion of the major factorial ecological models. Chapter III has a summary of the major characteristics of urbanization and the mechanisms behind the ecology of the Arabian city. Chapter IV covers the urbanization process and the mechanisms of urban structure in Kuwait. Chapter V presents the hypotheses to be examined and the variables used in the analysis. It also summarizes the methodology used to analyze data. In Chapter VI, 40 variables are factor analyzed and the major components identified along with the results of the field checking of the spatial structure of the factor scores. The same analysis is conducted on 45 variables for Jacksonville (Chapter VII). Chapter VIII contains the conclusions reached as a result of these analyses.

CHAPTER II
FACTORIAL ECOLOGY MODELS

The aim of this chapter is to trace the development of factorial ecology and to review the literature and major models.

A General Background

Ecology deals with the action of organisms--that is, aggregate, not individual, behaviors. In urban ecology, the interest is in the collective response of people to certain conditions in the system in which they live (Hawley, 1950).

The ecological approach was used in sociology and geography as early as the beginning of the present century. It was introduced by Robert Park, a Chicago sociologist, in 1916 (Park, 1916); within geography, it was introduced by Harlan Barrows (1923). This approach, which is known as "traditional ecology," prevailed until the middle of the century when a new formulation of urban ecology appeared. However, Barrow's influence was less than Park's as his ideas did not provide guidelines for a new orientation of the field (Hartshorne, 1939). This new trend became known as "factorial ecology." Each of these two periods has produced its own models which describe the characteristics of urban subareas. Although the traditional ecological approach was not in use by 1950 (Berry and Kasarda, 1977), its models were integrated in the new ecological approach, as will be discussed later.

The Traditional "Classical" Period

The analogical model that Park (1916) introduced stated that the processes which produce the human organization are similar to the ecological theories in plant and animal studies. These processes are competition, dominance, succession, and segregation.

According to this view, the different socio-spatial organizations in a city (e.g., Black ghetto, middle-income white suburb) are there because their members cannot compete with other dominating members or higher level organizations.

This ecological view was not the only traditional view in this period. Berry and Kasarda (1977) mentioned two more views. First, there is the "natural area" concept which describes the physical conditions of an area which is bound by natural features or major transportation routes, along with its social, economic, and demographic conditions. Studies in these directions were done by Zorbaugh (1929) and Wirth (1928).

The other view observed a certain social phenomenon, such as crime or mental health, and described its changes in relation to distance from the city center. Examples of this trend are found in the writings of Shaw et al. (1929), and Faris and Dunham (1939).

The decline of the traditional trend in human ecology is related mainly to three factors: first, its excessive dependence on competition as the basis of human organization; second, its exclusion of cultural and motivational factors; and third, the failure of some of its general concepts, such as concentric zonation and natural area, to hold up under comparative examination (Berry and Kasarda, 1977).

During this period three major models were developed representing mainly the structure of the Western city. The following is only a short summary of each model.

The Concentric Zone Model was developed by Burgess in 1925. He stated that population and housing vary in a gradient fashion from the center of the city. As a result, there will be several homogenous zones surrounding the Central Business District (CBD). These zones are the zone in transition, the zone of independent working men's homes, the zone of better residents, and the commuters' zone (Johnston, 1971a).

The Sector Model was developed by Hoyt in 1939. He stated that population and housing do not vary in homogenous concentric zones. Rather, they vary in homogeneous wedges from the city's center to the periphery. These sectors are:

a. High-grade residential development occurs along established lines of travel.

b. Zones of high-rent areas develop along better land (i.e., along lake, bay, river, high ground, ocean front);

c. A third high-rent area tends to develop toward the open country;

d. A high-grade residential area tends to develop along the fastest transportation facility;

e. A high-priced residential neighborhood tends to grow toward the homes of the leaders of the community;

f. Usually office buildings, banks and stores pull the high-priced residential neighborhoods in the same direction;

g. The deluxe high-rent apartments tend to be established near the CBD in old established residential areas;

h. The growth of high-rent neighborhoods tends to continue in the same direction for a long period of time;

i. High-rent areas tend to be adjoined by medium-rent areas, and sharp disjunctions in rental areas are not frequent (Johnston, 1971a).

The Multiple Nuclei Model was presented by Harris and Ullman in 1945. They stated that there is more than one nucleus affecting the residential organization. Some activities are unable to afford the most desirable locational sites; and some activities, such as industrial and high-status residential areas, are detrimental to each other.

These three models were criticized by many authors, mainly because they failed to explain, independently, spatial residential differentiation (Davie, 1938; Firey, 1947; and Rodwin, 1961). However, each of these models was proven later to be a good representative of certain parts of the residential differentiation problem. This will be shown in the next section.

Contemporary Urban Ecology

The concept of competition that prevailed in the traditional period of human ecology disappeared in the 1950's, and the concept of interdependence has prevailed (Berry and Kasarda, 1977). In this period the influence of the cultural dimension on the spatial organization of the society was emphasized. Bell (1955), Shevky and Williams (1949), and Winsborough (1963) were some of the early participants in the new urban ecological trend.

The contemporary urban ecological approach has two trends. One is a theoretical trend, represented by the social area analysis theory. This theory was developed initially by Shevky and Williams (1949) in their empirical presentation of census tract differences in Los Angeles. Three components were identified: social rank, urbanization, and segregation. The same findings were noticed in a study of San Francisco by Bell (1955), and the theory was explicated in 1955 by Shevky and Bell.

Social area analysis was presented as a part of a deductive model of social change based on three works (Johnston, 1978a):

1. The concept of increasing scale or interdependence provided by Wilson and Wilson in 1945;
2. The division of labor developed by Colin Clark in 1940;
3. The relationships between population concentration and social forms developed by Wirth in 1938.

The three components and their spatial patterns are:

Social Rank--includes variables on economy, education and occupation. This component varies sectorially similar to the Hoyt model.

Urbanization--includes variables on family structure, type of household, and women in the labor force. This factor varies radially in concentric zones around the center.

Segregation--includes variables on ethnic and racial structures of the population. This factor presents a spatial structure similar to Harris and Ullman's multinuclei model.

This theory is restricted to seven variables; three on the first component, three on the second component, and one on the third component.

The strong criticism of social area analysis concentrated on the following aspects:

1. The unit of measurement, census tract, cannot be accepted as a social area for persons with similar social positions (Hawley and Duncan, 1957), even though the census tracts were defined as areas with homogeneous population characteristics.

2. Several other criticisms were based on the idea that these factors were not universal and were too narrowly concerned (Schwirian, 1974).

Another approach in the study of urban ecology is related to the socio-cultural school of human ecology, which considers the ". . . land use and neighborhood character that were determined by people according to cultural goals" (Michelson, 1970, 16). Examples of works following this approach are of Firey (1947) and Jonassen (1949).

A recent approach to the study of urban ecology was explained by Michelson (1970). He devoted his book to the study of the neglected part of urban ecology, that is, the relation between man-made physical environment and social structure. He called the model the intersystem congruence model. Michelson suggested two types of congruences: mental congruence, in which "an individual thinks that particular spatial patterns will successfully accommodate his personal characteristics, values, and style of life" (Michelson, 1970, 30). The other type is experiential congruence, which "deals with how well the environment actually accommodates the characteristics and behavior of people" (Michelson, 1970, 31).

Factorial Ecology

The second trend, used widely in geography, is factorial ecology. The difference between factorial ecology and social area analysis is in the data input in the analysis. While the latter is theoretical, the former includes a wider range of variables in the input, with the social area analysis variables included.

Four major reference variables on which contemporary ecologists rely can be identified (Berry and Kasarda, 1977).

Population, which includes size, distribution, composition, and change;

Organization, which is anything that maintains a social unit. It is only analytically distinguishable from population.

Environment, which is the external influence upon the population under study. It could be the social environment, physical environment, or any other related type of environment.

Technology, which refers to the means (artifacts, tools, and techniques) used by a population in coping with its environment.

Since the input of variables is larger than in social area analysis, factorial ecology identifies more dimensions of urban, social, and physical organization.

The study and application of factorial ecology methods can be divided into three parts.

I. The Studies of North American Cities

In most of the studies on North American cities, all three components of the social area analysis were identified. One of the early and comprehensive studies in this field was published by Berry and Horton (1970). Fifty variables were factor analyzed for the urban region of Chicago (the city of Chicago was excluded), and 147 municipalities with 2,500 persons or more were considered. The analysis produced ten factors which reflected social, economic, and ethnic characteristics:

- socio-economic status;
- stage in the life cycle;
- race and resources;
- immigrants and Catholic status;
- size;
- the Jewish population;

- housing built in the 1940's;
- the Irish and Swedish population;
- mobility; and
- other non-white and Italian populations.

Another study by Schmid and Tagashira (1964) was made in Seattle to discover the basic dimensions in 42 variables for 117 tracts. The factors produced were:

- family status;
- socio-economic status;
- a "down-and-out" factor (Skid Road);
- residential stability;
- racial status; and
- population mobility.

The two authors then eliminated some variables that showed "mixed" loadings. They finished with ten variables which reflect the social area analysis theory.

Rees (1979) studied thirteen areas in the United States, using 46 variables on population and twenty variables on housing characteristics. The main results were that:

1. All the urbanized areas exhibited a socio-economic factor;
2. All the urbanized areas exhibited a family status factor;
3. All the urbanized areas showed at least one ethnic factor; and
4. Other factors related to housing characteristics.

In a longitudinal study of Chicago for the years 1950 and 1960 by Brown and Horton (1970), the authors described the changes in the main characteristics between the two years;

1. "Occupational polarization": the increase in the proportion of renters;
2. "Income profile": salary increase;
3. "Life cycle profile": increasing proportion of households in the middle life cycle; and
4. "Ethnic compositions": an increase in the number of black households.

Generally speaking, longitudinal studies in factorial ecology are not developed to the same degree as the studies of one period of time are.

In Canada, one of the earliest studies applying factorial ecology was done by Herbert (1972) in which he factor analyzed 34 variables obtained from the 1961 census, containing 86 census tracts in Winnipeg. The study produced eight factors. The first three factors were responsible for 65 percent of the variance, and the rest explained 23 percent. He considered the first three factors:

Factor I - housing style and family status;
Factor II - social prestige; and
Factor III - ethnic structure.

He concluded his study by stating that "the leading three factors are clearly reminiscent of the constructs of social area analysis and the great majority of North American analyses have produced similar results." (Herbert, 1972, 157).

Examination of the factor scores revealed the usual results: Factor I--Zonal, Factor II--sectorial, and Factor III--clusters.

A comparative study by Murdie (1969) on the factorial ecology of Toronto between 1951 and 1961 provided an example of change through time. Again, the factors of the social area analysis theory were the main dimensions in both years.

TABLE 1. CHANGE THROUGH TIME.

Dimension	1951	1961
Economic status	I	I
Family status	II	IV
Ethnic status	III	---
Italian	---	II
Jewish	---	V
Recent growth	IV	VI
Household characteristics	VI	III
Service employment	V	---

Source: Murdie (1969)

The changes as they appear in Table 1 were in ethnic structure and urbanization.

Another comparative study was done by Davies and Barrow (1973). They studied the factorial ecology of three Canadian prairie cities: Winnipeg, Edmonton, and Regina. They used 46 variables on socio-economic and household characteristics. Their analysis produced seven factors:

- General family status;
- General socio-economic status;
- Service sector--impoverishment;
- Late family status;
- French ethnic;
- Pre-family status; and
- German ethnic.

"The results confirm the established generalizations on the social structure of Western cities" (Davies and Barrow, 1973, 350).

The studies cited above are principally of large urban centers; very few studies have been done on small cities. According to Bourne and Barber (1971) in their study on small urban centers in Canada, "Small towns and cities exhibit less clearly defined activity zones, more heterogeneous residential areas, and generally lower spatial differentials among most urban attributes" (Bourne and Barber, 1971, 258).

II. Other Western Cities

In other Western cities in Europe and Australia, three different results came out of these areas. In Europe, outside Britain, a study on the factorial ecology of Copenhagen for the years 1950 and 1960 by Pedersen produced three main factors (cited in Herbert, 1972):

- Urbanization or family status with zonal distribution;
- Socio-economic status with sectorial distribution; and
- Population growth and mobility.

He used 14 socio-economic variables related to age distribution, employment status, industry in which employed, household size, sex ratio, and female employment. He applied his analysis on 76 urban zones.

Sweetser (1962) studied Helsinki, Finland, and compared it with Boston. He used 20 variables for 70 statistical areas in Helsinki. His main factors were:

- Socio-economic status;
- Family status; and
- Urbanism.

These two studies produced the main two dimensions found in North American cities--socio-economic and urbanism/familialism--but not an ethnic dimension. This is because "European cities do not, for the most part, possess the substantial, underprivileged ethnic minorities which are so typical of American cities" (Herbert, 1972, 166).

British cities do not reveal the same trend as is found on the continent. A study by Herbert (1970) of Cardiff and Swanson in South Wales used 26 variables for 334 and 221 enumeration districts respectively. The leading factors in the principal component analysis are reflected in the influence of the public sector on public housing characteristics. This trend is consistent in other British cities (Herbert, 1968).

The influence of the public sector creates two of the major dimensions in British cities, both of them part of the North American model. One of them is socio-economic status, created because municipal housing is allocated to tenants based on their income and occupation. Usually lower-income and lower-status groups are housed in this manner. The second dimension is related to family status, because housing policy gives priority to larger families.

On the other hand, the public decisions in the spatial allocation of housing projects are "both centrally and peripherally within the city and virtually all sectors" (Herbert, 1972, 181).

The third dimension of the North American case is absent in the ecology of British cities because of the limited numbers of highly segregated population. However, this is no longer the case for major large cities with large numbers of immigrants from commonwealth countries in Asia and Africa.

Studies of Australian cities showed a similarity to the structure of the American city structure. Jones (1968), in a study of 611 districts of Melbourne, Australia, using 70 variables confirmed the existence of the three dimensions.

III. Non-Western Cities

Abu-Lughod (1969) studied the factorial ecology of Cairo in 1947 and 1960 using 13 variables. The results for the two years were substantially the same, and three major factors were identified:

- Socio-economic status;
- Transients; and
- Social disorganization.

In another study of Calcutta, Berry and Rees (1969) included 37 variables and 80 wards of the city. Ten factors were identified and the major three were:

- a land use and familialism in gradient
- higher status Muslim concentration
- axiality in literacy.

Berry and Spodek (1971), in a study of the large Indian cities, found that "socio-economic status appears to be the dominant of these overreaching themes in the residential geography of the Indian city today. The communal and caste status of the classical texts and of village India, and of Poona in 1822, is being transformed into class status as an outgrowth of city life" (Berry and Spodek, 1971, 284).

The second factor was a result of the process of industry which presented a family-type distinction between familial areas and zones housing new male migrants clustered around the city's commercial center, new factory estates, mills, and docks. These conclusions agree with the conclusions of Abu-Lughod in her study of Cairo.

Morris and Pyle (1971) studied the factorial ecology of Rio de Janeiro. The analysis of 23 variables and two different types of units (74 zonas and 48 favelas), produced six factors in each analysis, with general consistency in producing factors on:

- Socio-economic status;
- In-migration; and
- Stage in life cycle.

Another study of the factorial ecology of a Middle Eastern city was done by Ffrench and Hill (1971) on Kuwait City. Because of the direct relation of this work to the topic of this dissertation, it will be presented in greater detail.

These researchers factor-analyzed 38 variables for each of the 39 census areas in the 1965 population census for Kuwait. The variables represented six types of characteristics. One group was called "General Characteristics," which included variables on religion, citizenship, marital status, sex, and education. The second group was labeled "Economic Status," which included variables on characteristics of level of occupational status. The third group was labeled "economic activity" with variables about type of occupation. The fourth group was called "Age Structure" with age groups as variables. The fifth group was "Nationality" with variables on the percentage of population in each nationality. The last group was "Center Characteristics" with variables on population density and the size of centers, where centers were defined as large neighborhoods bordered by major streets.

Factor analysis was conducted on the 39 by 39 matrix. Seven factors explaining more than 99 percent of the variance were extracted. The first three factors explained 92 percent of the variance. The factors were identified as:

Factor I: "Kuwait citizens," with variables of different socio-economic and family characteristics load highly on this factor.

Factor II: "Higher status non-Kuwaiti," with mixed variables on higher level of occupation and better educated people who were not Kuwaiti.

Factor III: "Lower status non-Kuwaiti" with variables on lower-level occupations and lower education. This factor includes several foreign groups and mainly Iranians.

Factors II and III reflect the importance of the foreign population on the structure of Kuwait City. This is emphasized more by the remaining factors, which, although they explain a very small amount of the variance, all reflect characteristics of the foreign population. For example, Factor IV is associated with the Jordanians, and Factor V with the Pakistanis and Indians.

The conclusions of the study were:

1. There are three social areas in Kuwait City. First, is the old city and other areas of immigrant invasion. Second are areas under construction with low-status immigrants, and third are the strongly Kuwaiti areas.

2. There is no indication that the urban ecology of Kuwait is different from the general non-Western city model.

Although there are very few studies in English on the factorial ecology of cities in East and Southeast Asia, available information indicates the existence of the general characteristics found in the non-Western city.

The North American Model

From the reviews already experienced on the factorial ecology of North American cities, the following dimensions can be expected to result:

Socio-economic status. "If variables of known relevance in social stratification [are used] in the analysis, a socio-economic status dimension, and usually only one, emerged in the analysis" (Rees, 1979, 15). The variables included in this factor are related to educational attainment, income, occupation, household value, and density of occupancy of housing space.

Familialism (urbanism). This factor is measured by variables such as age structure of the population size of household variables, marital status variables, and housing type categories.

Ethnicity. This dimension groups the population according to ethnic status such as race, origin, language, and religion.

Mobility. This factor includes variables that measure migration rates, population change, and migration by origin (Rees, 1979).

Housing. One or more factors of housing characteristics may be produced, depending on the number of housing variables used. Usually these factors parallel those of socio-economic status, familism and ethnicity (Rees, 1979).

Other factors. With each factorial analysis other factors will be produced, but they explain very little of the total variance. They will confuse rather than clarify the explanation, and they will reflect some local deviations. Thus, these factors may be neglected in the general model.

This general model of North American cities, although found in many studies, showed some deviations in southern cities. A study by Van Arsdol et al. (1958) found that in southern cities with a high percentage of black population socio-economic and familialism dimensions will be associated. This deviation is explained by the low status of the black population combined with its high-fertility rate, the constraint upon mobility, and a limited housing market. This prevents the emergence of familialism as an independent factor (Herbert, 1972).

The European Model

Two major and common factors are presented in the European cities, socio-economic status and familialism. These are two of the dimensions of the North American model. The third dimension is missing because of the smaller number of person in ethnic categories in comparison with those in North American cities (Herbert, 1972).

The British Model

The influence of the public sector in shaping cities is great. This influence produced the same dimensions as in the North American model, but the spatial structure of each dimension is different. These dimensions are socio-economic status, stage in life cycle, and ethnic minorities, particularly West Indians, Indians, and Pakistanis, found in some British cities in relatively small scale (Herbert, 1972).

Australian City Model

The Australian city has the same factorial ecological structure as the North American city (Herbert, 1972).

Non-Western Cities Model

It is difficult to outline a specific model to represent the non-Western cities. The dynamics of differences among these cities can be summarized by one major element--stage or level of modernization. The lower the level of modernization, the more the tendency toward a single factor, including the three major dimensions. The higher the level of modernization, the more these factors will be identified (Abu-Lughod, 1969; Herbert, 1972).

Schwirian (1974) outlines the reasons for differences in the factorial structure between Western and non-Western cities with three points:

1. Western, and particularly American cities, perform commercial-industrial functions, while the non-Western cities are administrative centers.

2. There are differences in the level of transportation and in transportation ownership patterns.

3. There are differences in the level of technology, such as communication.

This chapter contained a review of the literature and major models of factorial ecology. This review included the development of factorial ecology since its introduction in the early years of the present century and also included the major current models of factorial ecology for different regions of the world. Chapter III will discuss the structure of Arabian cities and the literature on the residential structure of these cities.

CHAPTER III
THE FACTORIAL ECOLOGY OF THE ARABIAN CITY

This chapter discusses the major urban ecological characteristics of the contemporary Arabian city. Naturally, it would have been desirable in this study to have used the more recent methodological concepts, but unfortunately this was impossible because of several limitations.

Limitations and Problems

Although an increasing number of individual case studies are now appearing, there is relatively little information of a comparative nature on urban ecology of the Arabian city. The major factors contributing to this problem are as follows.

Lack of comprehensive studies. The trend is toward studying one city as a case study, with the rare inclusion of several cities. The reason for this deficiency is discussed below.

Lack of data for many cities. The problem here is not the nonexistence of such data. It is safe to say that within the past two decades most cities and towns in the Middle East have had at least one comprehensive data collection made. The actual problem is in obtaining these data which are often designated as publications with limited government use. Even if the data are not so classified, they are difficult to locate. For example, the Saudi Arabian Census Department does not allow census materials about socio-economic characteristics of units smaller than a city to be released. Even planning consultants must collect their own data.

Lack of longitudinal data. Since ecological researchers are interested in urban changes over time, as well as cross-sectional changes and differentiation, this problem has often handicapped those making comprehensive urban ecological studies of Arabian cities.

Inconsistency in Methods and Scales

Since any conclusion about the ecological structure of the contemporary Arabian city will depend partially on the case-study style of the various research documents, the problem of different methods and scales used by different writers raises the problem of comparability.

As a result of these shortcomings, the following two caveats should be remembered by the urban ecology researcher.

First is the danger of generalizing from case studies which do not have the power of a comprehensive set of information. Conclusions drawn from case studies without a common theoretical basis reflect local characteristics more than widely applicable generalizations.

Second, generalizations made from studying Arabian cities, as well as other parts of the Third World, depend on cross-cultural, as well as intra-cultural case studies which involve differences in scales, techniques, definitions, and assumptions.

Directions in the Study of the Ecological Structure of the Arabian City

There is no comprehensive study of the urban ecology of the Arabian city, and, apart from the two studies by Abu-Lughod (1969) on Cairo and Latif (1974a) on Alexandria, none on any single city. Therefore, from reviewing the literature on collective or single cases, three groups of information resources are distinguishable.

First, factorial ecology studies on which only two studies are available. Both are on cities in Egypt (Cairo and Alexandria) and employ cross-sectional and longitudinal tests of the social area analysis theory. This is an example of the effect of the limitations previously mentioned on research that is dependent on official data.

Second, there are many studies on collective and single cities which describe some aspects of their ecological structure. Some of the collective studies deal with one country, such as the study of the Moroccan cities by Hamaida (1972), or a whole region (Costello, 1977; Beaumont et al.,1976). The major characteristics of these studies is that they depend on personal observation and collection of data. The subjective nature of the generalizations may be considered a deficiency compared with the first source.

Third, there are countless studies and generalizations about cities in other parts of the Third World (or developing countries) which could be used as preliminary hypotheses or as sources of hypotheses about the ecological structure of the Arabian city because similarities in several aspects of economic and social development exist (Breese, 1966; Amato, 1970a; Beaumont et al., 1976; Dwyer, 1974; and Fisher, 1978).

Factors of Urban Expansion

There are at least four factors behind the urban expansion in population and area in the Arabian city:

1. The rate of natural population increase, which differs from one country to another according to the relative level of development of each country, is, in the Arab countries, one of the highest in the world, especially following the improvement in medical care which is reducing the death rate drastically (Clarke and Fisher, 1972).

2. Migration is one of the most important factors affecting the growth of Arabian cities today. Rural-urban migration accounts for a large proportion of the annual increase in cities in overpopulated countries such as Egypt, Morocco, or Syria. The in-migration from other

countries accounts for a large proportion of increase in countries which are underpopulated, such as Saudi Arabia, Kuwait, and Libya.

3. Long-term, interest-free government loans were made, for example, for residential buildings in Saudi Arabia, Kuwait, Morocco, and Libya. Since most of the cultural and recreational facilities are concentrated in large urban areas, these areas have been the target as a residential choice. In other cases, the government itself directed the process of urban movement by building public housing projects in the major cities. This is the case in public housing in Egypt and Algeria, for example.

4. The strong tendency toward industrialization and concentration of major industries in urban areas is an important factor in the urban growth in the region. The classical example is Cairo where a large textile industry is located to the north of the city and large steel manufacturing complexes to the south, leading to the encroachment of urban development on the rich agricultural land in both directions. All major cities of the region suffer from this problem.

Saudi Arabia's new towns of Al-Jubail on the Gulf and Yanbu on the Red Sea are examples of the tendency toward relieving the major cities of this traditional problem. Each of these towns is expected to become an industrial center in its region, especially in petrochemicals. Both are located at least two hundred kilometers from the nearest large urban center.

Factors Directing the Urban Expansion

As there are factors causing urban growth and expansion, there are also factors that direct this expansion. These factors can be grouped in the following manner:

Legal factors. Most of the Arabian cities have already adapted a special urban planning policy, and each city has a "master plan." Therefore, in addition to planning and rebuilding the old sections of a city, there is also a strong tendency toward directing the expansion of the built-up area into the vacant lands around the city. As a result, there are sections which are reserved for residential, commercial, or industrial uses. However, many difficulties and problems have come about from applying these plans. Two will be mentioned here. First, there has been a tendency toward concentrating planning effort in the higher middle-class and other higher-income areas, while low-income areas benefited least from the planning. Second, in the application of a plan's zoning ordinances, changes have, in many instances, been made contrary to the public interest, with the result that residential and industrial or commercial activities have been mixed in some areas (Balfaqueh, 1979).

Economic factors: income. One of the major economic factors that some writers have mentioned in regard to the structure of the contemporary Arabian city is the existence of huge differentials among income levels (Balfaqueh, 1979; Hamaida, 1972).

Social factors. An example of social factors is the migration of the rural population to the cities.

The absence of local control. The power of regulating the uses of land is usually in the hands of a central authority, with no local consideration in such regulations. The results have been actions that interfered with local interests. Some cities (depending on the country) have municipal councils, but even their powers are overruled by the power of the central authority.

Speculation. The huge increase of oil revenues and other resources in some countries has led to an increase in income, one effect of which was the development of speculation in lands around the city. Therefore, zoning and rezoning were largely affected by the speculation process.

Elements of Similarities and Differences among Arab Cities

One more aspect to be discussed briefly here is the differences and similarities among cities. This section is presented to explain deviations from the generalizations that could be extracted about Arabian cities.

Elements of Similarities

History. The entire region experienced similar historical periods. For example, in almost every part there was influence of ancient, Roman and Islamic effects.

Culture. This is represented by a common language and a common religion.

Elements of Differences

Industrialization. Whereas some countries are over-populated, others are underpopulated. This, as expected, is reflected in the composition of the city dwellers. For example, more foreigners are found in Kuwait City than in Cairo to fill the available jobs and the rural population is greater in Cairo than in Kuwait City.

Colonial history. Britain and France were the major colonial powers in the region; lesser powers included Spain and Italy. On the other hand, some countries were not under any colonial power. Within the countries which experience colonialism, differences in the influence of the colonial powers on the cultural, social, and economic local life are evident today. For example, French influence on the Maghrib countries, Syria and Lebanon, is apparent today in that French is widely spoken and building style and patterns of commercial and recreational activities all reveal French taste. On the other hand, in Egypt, Iraq, and Southern Yemen, English is not common and there is very little, if any, direct influence on modern-day public life of the British colonialism. This does not mean, however, that there exists no indirect effect of the colonial period. Countries without colonial experience, such as Saudi Arabia and Northern Yemen, are expected to show local differences in the urban structure.

The question now is, "What are the characteristics of urban ecology of Arabian cities?" A comprehensive answer is impossible at the present time, largely because of the lack of cross-regional studies. The remainder of this chapter will try to answer this question from available literature with respect to the three directions mentioned earlier.

Factorial Ecology Studies

Only two studies using the factorial ecology approach in the analysis of the structure of the Arabian city are available, each using a cross-sectional and longitudinal structure of an Egyptian city. They are Abu-Lughod's (1969) test of the social area analysis theory on Cairo and Latif's (1974a) study of the social area analysis of Alexandria. Both were discussed in Chapter II.

Regional and Local Studies within the Arab World

Several geographers studied the internal structure of the Arabian city within a small regional context, usually a single country or a single city.

One of these studies was provided by Hamaida (1972) in his book, Morocco, wherein he tried to give a picture of the spatial socio-economic and family characteristics of the Moroccan city. He was looking at the city within a larger conceptual framework, that is, identifying it with similarities and differences in other Arabian cities. For this reason, and because of his detailed study, his division of the Moroccan city will be used as a starting point to identify the ecological structure in this direction.

According to Hamaida, the Moroccan city is divided into five sections with regard to socio-economic and family characteristics.

The Madina or the Old City. The madina is a local traditional neighborhood which exhibits the historical character of the city. Since modernization and growth of most of the Arab cities took place relatively recently, this part of the city still exhibits different functions, from residential to commercial to traditional crafts. The major characteristics of this section are:

- low-income population;
- high-population density, about 500 persons per hectare ($50,000/km^2$);
- old, multi-story buildings; and
- the existence of intensive traditional commercial activities intermixed with the residential area.

Wahaiba (1975) in his study of Egyptian cities presented the importance of socio-economic factors which are reflected in his spatial structure of the Egyptian city: poor areas, middle-income areas, and wealthy areas. The poor areas include the old section of the city which, according to Wahaiba, exhibits characteristics similar to those given by Hamaida with the former giving more details about the occupational structure of the residents in this area. They are mainly craftsmen, small officials, and laborers.

Costello (1977) reviewed some of the ecological characteristics of several Arabian cities. In his review of Cairo and Alexandria, he arrived at the same conclusions as did Abu-Lughod (1969) and Latif (1974a). His reviews of Kuwait and Beirut provide interesting information about this subject. Beirut's old section does not differ from the structure described in Hamaida and Wahaiba. Kuwait, on the other hand, deviates from this structure in that the old city is occupied by foreigners, especially of low status. Kuwaitis have moved, as a result of government loan actions, to the suburbs.

Beaumont et al. (1976), in their book The Middle East, give a very short summary of the characteristics of the Middle Eastern city of today. Most of the discussion is on the old town or the madina. In addition to the characteristics stated earlier, they give more details:

1. The city's highest density is found in the madina.
2. There are low rates of literacy.
3. There is a lower proportion of economically active females.
4. There is the prevalence of a social structure based primarily on kinship and clan groupings.
5. The madina usually accommodates a small share of the total urban population.

Fisher (1978) summarized the characteristics of the madina in a more traditional ecological form. He said that the traditional quarters have experienced the movement of the urban elite into the new suburbs, leaving the madina to the low-income group of the city, the new poor migrants from rural areas, and in-migrants from other countries. The residents live in high-density buildings (number of families per unit and number of members in the family).

There is great similarity between Fisher's statement and the process of filtering in the ecological theory of urban structure (Smith, 1971). But the pattern is different from that found in several South American cities where middle-class population tends to congregate in the central part of the city (Amato, 1970a).

The New Central Area. This section is neglected by writers other than Hamaida. Actually, they usually include it with the surrounding residential areas. The distinctive character of this section compared to the old city, in addition to the physical regularities, modern planning, and appearance, is that its ecological characteristics seem to be different from both those of the old city and the surrounding residential areas. For example:

1. There is greater population density than in the surrounding residential area, but less than in the old section. The reason for this decrease in population or residential density is related to the existence of more modern commercial activities which consume large space and more than the street-front space.
2. Income tends to rise slightly.
3. The occupation of the residents varies from lower middle-income groups, which are usually comprised of merchants and employers in the various central functions.

The Shantytowns or Bidonville. This part of the city has had a considerable amount of attention from various writers because it houses a large proportion of the city population.

This area is settled by new rural migrants and some of the poor who cannot afford the high rent of the central area, or who were forced to move from central areas, especially the madina, as a result of the continuous destruction of the old part of the city. These shantytowns, or spontaneous settlements, exist in all large cities in the

Arabian world. Examples of these are the Ushash in the Egyptian cities, Al-Sarayef in Baghdad, Al-Baracat in Beirut, the Karantina in Jeddah, and the Bidonville of Casablanca.

In addition to the absence of any plan in their development, these areas suffer from lack of many basic services, such as sewers, potable water, electricity, and the like. This situation presents severe health risks and serious social problems. Density is relatively very high if we consider the maximum space available; and the income is the lowest in the city.

New Residential Areas. Here are the new middle-class residential areas, according to Hamaida (1972) which, although they occupy a large part of the city, come third after the madina and the shantytown in terms of population and density. However, socio-economic status is better as income tends to rise and residential conditions accordingly improve. With regard to occupational characteristics, this area is occupied by small officials, workers, and small traders.

In Egyptian cities, Wahaiba (1975) mentioned similar socio-economic and occupational characteristics, the differences being only in density which tends to be higher in these areas of the Egyptian cities, and in population since these areas are all occupied by more residents than any other residential division. However, this last characteristic could be attributed to the differences in the scheme used to identify each section.

Costello (1977) reported more interesting findings about Kuwait City and Beirut. Generally, he confirmed the existence of the socio-economic characteristics mentioned earlier regarding these sections. However, well-defined religious and ethnic segregation exists in Beirut and Kuwait City respectively. For example, three middle- and upper-income residential areas can be identified in Beirut:

1. Achrafieh: a middle-class and upper-class Christian area;
2. Basta: a middle-class and lower middle-class Suni Muslim area; and
3. Al-Hamra: an area with mixed ethnic and residential population, being the Manhattan of Beirut where the residential and commercial functions intermix.*

In Kuwait City the segregation is ethnographic. Apart from the old city and the shantytown development, residential areas are divided into two types:

1. Areas occupied by foreigners where two social subareas can be identified:

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*This area belongs to the section titled new central area mentioned earlier; and it is here for comparison with the other two segregated areas.

   a. Areas occupied by a higher-status population consisting mainly of British, Americans, and Jordanians.
   b. Areas occupied by low-status immigrants who are mainly manual workers, mostly in the building trades. Major nationalities found in this section are Iraqis, Saudis, Palestinians, Indians, Egyptians, and Pakistanis. In addition, these ethnic groups are characterized by male dominance and low income while the areas in which they live generally have high-population density.
2. The Kuwaitis' residential areas where another two subgroups (low and high socio-economic status areas) can be differentiated.

This pattern of segregation seems to be emphasized by local factors rather than being a general factor of the region. This generalization is supported by the descriptions of Hamaida (1972), Wahaiba (1975), Costello (1977), Beaumont et al. (1976), and Fisher (1978).

Wealthy Suburbs. Hamaida (1972) finally identifies a fifth, and small, section of the city which is the wealthy suburbs. In this section the very rich and the community leaders live. The Western style of life prevails, with large housing units and the absence of any commercial or multifamily uses. The only other use besides residential that could be found was for embassies or government offices which do not attract many people. Moreover, income is the highest and population density is the lowest, 20 to 25 persons per hectare.

Third World or Developing Countries Studies

Relatively few studies on the factorial ecology of the Third World cities are available. Those studies available were reviewed in Chapter II.

This chapter contained a review of the major dimensions of the present-day Arabian city from available research which conforms in general to the findings in other cities of the developing countries. Chapter IV will summarize the general characteristics of urbanization and urban structure in Kuwait City and in Jacksonville.

CHAPTER IV
URBANIZATION AND URBAN STRUCTURE IN KUWAIT AND JACKSONVILLE

In this chapter brief histories of urban development and population growth for Kuwait City and Jacksonville are outlined.

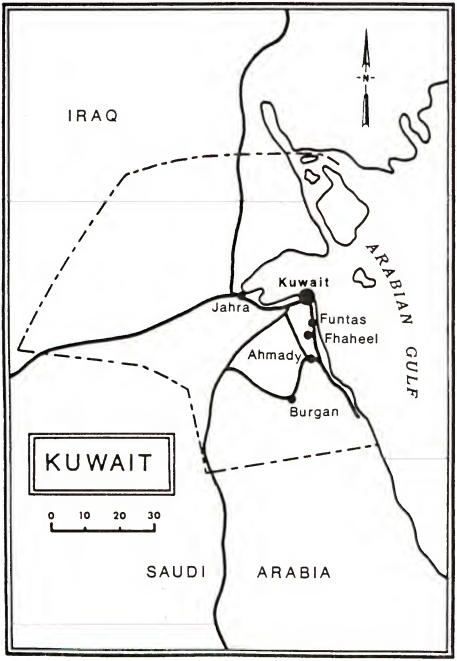
Kuwait

Kuwait is a triangle of land occupying the northwestern head of the Arabian Gulf (Fig. 2). One side is formed by the sea along the Kuwait Bay. The second side is formed by the Kuwait-Iraqi boundary, and the third side is formed by the Kuwait-Saudi Arabian boundary. Most of the land is flat and desert.

Historical Development

For centuries the economic life of Kuwait depended on the Arabian Gulf. Pearling and fishing were carried on in the shallow coastal waters and a commercial fleet of 800 small ships supported its commercial activities. During the period between the 18th century and the beginning of the present century, this commercial fleet connected the small settlements in the upper part of the Gulf with India and the coastal areas of East Africa. The impact of these commercial activities in the pre-oil era was too small to

FIGURE 2. KUWAIT


IRAQ
ARABIAN GULF
N
Kuwait
Jahra
Funtas
Fhaheel
Ahmady
Burgan
KUWAIT
0 10 20 30
SAUDI ARABIA

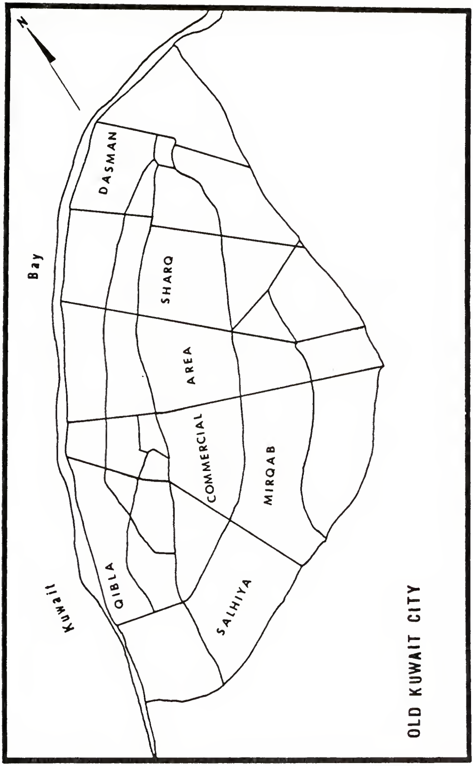
have any significant visible impact on the urban landscape or to change the history of the urban development of Kuwait City. In its commercial activities, Kuwait imported most of the consumed goods, while its exports were pearls, sheep, and other items made or raised by the Bedouins in the desert (Mutwalli, 1970).

Until 1947, Kuwait City was a small town enclosed by a mud wall, containing four major residential areas: Sharq, Quibla, Salhiyya, and Mirquab (Fig. 3). This area forms what is known in the literature as the madina. Few, relatively wide, streets separated these quarters from the major town market located in the middle. At this time the population of the city was between 10,000 and 15,000 inhabitants.

Oil was the resource which changed the human landscape of Kuwait. In 1938 the British government discovered oil in this area, but the events of the Second World War stopped its production until 1946. Oil revenues speeded up changes in the human landscape. Not only had the traditional economic base disappeared and the per capita income increased, but the city increased its area from 8.59 sq. km. to about 160 sq. km. in 1965. Generally speaking, these changes can be outlined as follows:

Increase in the total population. This occurred either because of high natural population increase resulting

FIGURE 3. KUWAIT CITY



OLD KUWAIT CITY

from improvement of medical serviced or from the influx of immigration as a result of the large number of employment opportunities.

Increase in per capita income. The huge oil revenues and the relatively small number of Kuwaiti citizens were reflected in the per capita income data. For a long time it was the highest in the world until recently when another Gulf state (Abu-Dhabi) took its place.

Increase in government expenditure on services. This included free medical care and free education.

Increase in the rate of urbanization. The city of Kuwait expanded far beyond the walls of the old city, and new urban centers developed in other parts of the country. Most of these urban centers are oil industrial areas. Ahmady is the largest of these settlements. It houses a large oil port, an oil refinery, offices of oil companies, and housing camps for their employees. The remaining settlements were small, built around oil drilling activities and housed the workers at these petroleum operation sites.

A second type of settlement is characterized by those which grew around Kuwait City, mainly to the South and along the Gulf coast. These communities, such as al-Fhaheel, al-Manjah, and Funtas, grew as bedroom communities and some type of the "New Town" system.

These characteristics led Kuwait to be the most urbanized country in the Middle East as shown in Table 2.

TABLE 2. COMPARISON OF URBANIZATION LEVEL BETWEEN KUWAIT AND THE AVERAGE FOR THE ARAB WORLD.

	Level of Urbanization (Percentage Urban Population)	
Year	Kuwait	Arab Countries
1950	51	25
1966	62	36
1974	90	42

Source: al-Qutub and Abu Ayyash, 1980.

TABLE 3. TOTAL POPULATION BETWEEN 1957-1980 AND THE DIVISION BETWEEN THE NUMBER OF KUWAITIS AND THE NUMBER OF FOREIGNERS.

	Population		
Year	Kuwaitis	Non-Kuwaitis	Total
1957	113,622	92,851	206,473
1961	161,909	159,712	321,621
1965	220,059	247,280	467,339
1970	345,898	387,298	733,196
1975	472,088	522,749	944,837
1980	562,065	793,762	1,355.827

Source: State of Kuwait, Ministry of Planning, Preliminary Results of the Population Census, 1980.

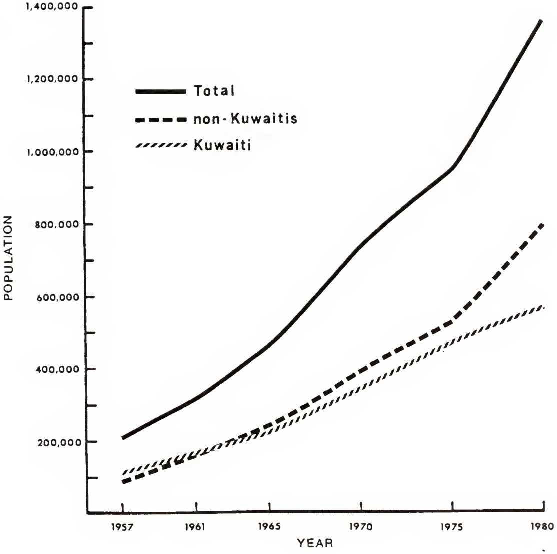
A unique characteristic of the population of Kuwait is the high percentage of its foreign population. Table 3 shows the population of Kuwait in the last five censuses.

This information is presented in Figure 4. Two conclusions can be drawn from the figure: first, there is a large increase in the total population; second, since 1965, the proportion of the non-Kuwaitis in the total population exceeded that of the Kuwaitis. The differences between the two groups are expected to be high because first, the immigration to Kuwait is relatively recent, generally since the development of the oil industry. Therefore, it is expected that the foreign population remaining in Kuwait is more tied to the countries of origin than to the host country. Second, migration to Kuwait is characterized by the temporary type, which reduces the chance for assimilation with local traditions. And, third, migration to Kuwait is restricted by government regulations on obtaining Kuwait nationality. The immigration laws leave a very slight chance that citizenship will be granted to foreigners at the present time. Even a long stay is discouraged by the regulations governing land ownership and the permits issued for commercial activities.

Jacksonville

Jacksonville forms an urban development located on the northeastern coast of Florida. Politically, the city

FIGURE 4. KUWAIT POPULATION


1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
POPULATION
Total
non-Kuwaitis
Kuwaiti
1957
1961
1965
1970
1975
1980
YEAR

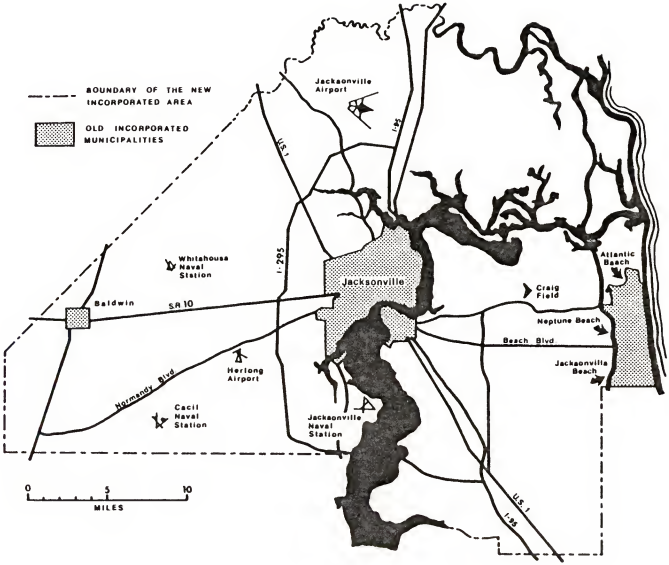
includes the whole area of Duval county, due to consolidation of the city and county governments in 1967. As a result, the area of Jacksonville covered 840 square miles. However, only 25 percent of this new city has been developed. What might create a problem for the researcher in the field of urban ecology is that the undeveloped lands are not located on the periphery of the city, but, rather, they are located in the middle where they separate one large community (the old city of Jacksonville) from other smaller communities (Jacksonville Beach, Atlantic Beach, Neptune Beach, and Baldwin) as shown in Figure 5.

The city of Jacksonville is 18 miles inland, divided by the St. Johns Rivers, which flows north and east through Jacksonville before emptying into the ocean.

The total population of the city in 1970 was 528,865 persons which makes it the most populous city in Florida, and the 23rd largest city in the nation. These numbers are associated with political definitions, and they become meaningless if the Standard Metropolitan Statistical Area (SMSA) definition is used. For under the SMSA definition, Jacksonville is third in the state and 57th in the nation.

Although Jacksonville had a very slow start in the first quarter of the 19th century, it has developed steadily since the end of that century and the beginning of the 20th. Its growth was related to several functions.

FIGURE 5. MAP OF JACKSONVILLE


BOUNDARY OF THE NEW INCORPORATED AREA
OLD INCORPORATED MUNICIPALITIES
Jacksonville Airport
I-95
U.S. 1
I-295
Whitehouse Naval Station
Baldwin
SR 10
Jacksonville
Herlong Airport
Normandy Blvd
Cecil Naval Station
Jacksonville Naval Station
Craig Field
Atlantic Beach
Neptune Beach
Beach Blvd
Jacksonville Beach
U.S. 1
I-95
0
5
10
MILES

The city for a long time has been a tourist area, seaport, naval base, educational center for the northeastern region of Florida, a railroad node, and more importantly in recent years, a major financial and commercial center. Table 4 shows the growth of population during the three decades between 1940 and 1970.

Table 4. POPULATION GROWTH IN JACKSONVILLE BETWEEN 1940 AND 1970

Year	Population*
1940	210,143
1950	304,029
1960	455,211
1970	528,865

*All numbers are for the newly incorporated city.
(Source: U.S. Bureau of the Census, 1940, 1950, 1960, and 1970)

The Port

The river front in Jacksonville provides a protected harbor which has become an international port and one of the largest ports in the southeast. The port is located on the St. Johns River, about 20 miles inland from the Atlantic Ocean, and it is considered "The single most important element in the economy of Jacksonville's SMSA--

past, present, and future. The port holds the key to Jacksonville's founding, growth, present development, and future potential" (Gould Associates, 1968).

The growth of the city was supported by the condition of the river as it can be traveled 300 miles south of the city. This opened a wide hinterland providing settlers, travelers, crops, and supplies.

The ocean trade is characterized by the absence of the domination of a single commodity. Coffee, automobiles, petroleum products, paper products, and vegetable food--all are major items from the standpoint of value and tonnage. This condition is unlike Tampa which has a large proportion of its cargo consisting of bulk shipments of phosphates.

Transportation Services

Jacksonville is served by five railroad lines, six airlines, and more than 200 firms in trucking and warehousing (Gould Associates, 1968). There are also two major interstate freeways intersecting in the city. Most of the importance of these transportation activities is related to the importance of the port activities.

Military Activities

There are three large naval installations--Jacksonville Naval Air Station, Cecil Field Naval Air Station, and Mayport Carrier Base. These three centers contributed at the end of the 1960s more than 107,000 persons to the population (about 20 percent of the city's population) and $230 million to the economy (Gould Associates, 1968).

Other Services

These include wholesale trade, which mainly includes motor vehicles and automobile equipment, and groceries and related products. Moreover, Jacksonville became the location of several local and regional finance, insurance, and real estate offices of major companies.

Retail trade is the first in the rank of activities within the civilian economy. Until recently, downtown Jacksonville was the center of retail trade for the surrounding area. However, a number of large shopping centers have been developed in different parts of the city's suburbs which reduced the importance of the downtown in this respect.

Although manufacturing employment is highly ranked in the local economy, Jacksonville is not primarily a manufacturing center (Gould Associates, 1968). Most of the industries are of small scale and of relatively recent origin. The major industries of Jacksonville are food processing, shipbuilding, paper products, printing and publishing, tobacco manufacturing, chemicals and allied products, and stone, clay, and glass.

This chapter outlined the major elements in the historical growth of the urban areas of Kuwait City and Jacksonville. Chapter V will outline the hypotheses to be examined, and it will discuss the methodology that will be used in the analysis.

CHAPTER V
HYPOTHESES AND METHODOLOGY

This chapter first outlines the major hypotheses to be evaluated; secondly, it briefly outlines the major concepts in factor analysis; and finally, it summarizes the nature of data for both Kuwait City and Jacksonville.

Hypotheses

The hypotheses of this study are presented in the form of three questions:

Hypothesis I. How does the residential structure of Kuwait City as a non-Western city represent the model of the non-Western city, and how does the residential structure of Jacksonville represent the model of a Western city?

Hypothesis II. How is the residential structure of Kuwait City different from the Western city model represented by Jacksonville?

Hypothesis III. What are the general dimensions of the residential structure in an originally non-Western society which is applying the development methods used in Western societies, and what is the spatial pattern of each dimension?

Methodology

To extract the dimensions or factors, factor analysis will be used. Generally, this method analyzes the variables simultaneously and reduces them to fewer new dimensions.

Two major methods of factor analysis are used by geographers. The difference of the two methods is mainly in the treatment of the error term. First, the principal components analysis method does not include an error term in its model. The result is a set of factors whose maximum variance equals the number of variables (Johnston, 1978b). For example, in a four-variable problem the model will be:

$$X_1 = f\ (FI,\ FII,\ FIII,\ FIV)$$
$$X_2 = f\ (FI,\ FII,\ FIII,\ FIV)$$
$$X_3 = f\ (FI,\ FII,\ FIII,\ FIV)$$
$$X_4 - f\ (FI,\ FII,\ FIII,\ FIV)$$

where FI, FII, FIII, and FIV are the four components.

Second, the common factor analysis method includes an error term in its equation. Moreover, the variance is composed of two types: common variance, which is the portion of the total variance that correlates with other variables, and specific variance, which is the portion of the total variance that does not correlate with any other variable (Cole and King, 1968). The example of the four variables will be:

$$X_1 = f\ (FI,\ FII,\ FIII,\ FIV) + U_1$$
$$X_2 = f\ (FI,\ FII,\ FIII,\ FIV) + U_2$$
$$X_3 = f\ (FI,\ FII,\ FIII,\ FIV) + U_3$$
$$X_4 = f\ (FI,\ FII,\ FIII,\ FIV) + U_4$$

where FI, FII, FIII, FIV are the set of factors, and U_1, U_2, U_3, U_4 are the unique variants for each variance. In common factor analysis, the number of factors will be less than the number of variables. Principal component analysis will be adapted in this study, and the reason for this decision will be mentioned on Page 73.

Several factors will be extracted; and a major consideration must be given to when to stop the procedure. Yeates (1974) suggested several methods.

1. All values having less than unity in the eigenvalues should be excluded. This criterion should be used with care in the case of components with eigenvalues near 1.0.
2. All factors explaining less than five percent of the overall variance should be excluded because any factor explaining less than this proportion must contain a large proportion of random-error variance.
3. By graphing the cumulative proportion of variance explained by all the factors, there will be found

a marked break in slope or discontinuity which divides the more significant components from the less significant ones.

In this study, the first method will be used. Eigenvalues which are the sum of the loadings on each factor with unity or more will be retained.

Rotation is an important concept in factor analysis because it will influence the analysis and the conclusions. The procedure of rotation is one in which the two factor axes are located among the two groups of variable vectors rather than between them (Taylor, 1977). Two major types of rotation can be identified:

1. Orthogonal rotation, which assumes no interaction between the factors.
2. Oblique rotation, which assumes the existence of some correlation between the factors. The two solutions will be identical if the factors are actually independent, but if they are not, then the solutions will be different, and the oblique rotation model will be more appropriate.

Since this study will use principal components analysis, orthogonal rotation will be used.

Factor scores are the scores of each observation unit on each factor. They are used in geographic research to prepare maps of the spatial patterns of each factor. A major problem associated with these scores is that they are only estimates because factor analysis deals only with the common variance, whereas the observed values on the original variables combine common and unique elements (Johnston, 1978b). However, this does not prevent great advantages from using the spatial pattern of these scores.

Some Problems of Applying Factor Analysis in Geography

One of the major problems in factorial ecology and particularly in comparative studies is that the resultant factors are dependent on the data which were input. The variables in factorial ecology, unlike social area analysis, are not predetermined. Moreover, the choice depends on the availability of data and does not depend on theoretical framework (Schwirian, 1974).

This involves the choice between several factor analysis techniques available for extracting the major dimensions. Each technique might produce a different solution which may lead to a method-dependent factor, which in turn will lead to wrong conclusions.

The problem of unit measurement is popular in the factorial ecology literature. One of the many criticisms of the factorial ecology approach was made because of the unit of measurement. Most, if not all, factorial ecology researchers use spatial census units as the unit of measurement. This choice has no theoretical justification. The principal reason that this areal unit is used is because it is easy to obtain, if it is not the only unit available.

One alternative is to use block data, but this will create a problem of comparison, where this type of data on the scale of spatial resolution is not obtainable in most parts of the world.

One should not ignore the many advantages of this method. First, the relatively successful application of this method was shown in many instances in Chapter II. Second is its ability to reduce the large number of variables to a smaller set which is easier to understand. Third, it has the capability to reveal hidden dimensions by identifying associations among the chosen variables.

Data

The data used in the analysis are obtained from the population census of 1975 for Kuwait City and the 1970 population census for Jacksonville. Although the problem of similarity in the available variables is presented in comparing Tables 5 and 16, it is of relatively little importance. This is because of the great detail available in the 1975 census in Kuwait in comparison with any previous census or with the census in some other developing nations.

Kuwait City is divided into 49 sections. Each is called a "population concentration" by the census department. Each population concentration is an area with a boundary recognized for official uses and one which has a publicly recognized name. In the case of the absence of a recognized boundary, an artificial boundary is defined for census purposes.

In addition, there are five population concentrations in the form of New Towns mainly to the south of the city. The total number of population concentrations in Kuwait then is 54 units (Fig. 6).

For Jacksonville, data were obtained from the 1970 population census. The SMSA of Jacksonville contained 101 census tracts (Fig. 7), some of which were quite large, essentially rural, areas. To some degree the definition of the census tract is not identical to the definition of population concentration. The former were "small areas into which large cities and adjacent areas have been divided for statistical purposes. . . . Tracts were generally designed to be relatively uniform with respect to population characteristics, economic status, and living conditions. The average tract has about 4,000 residents" (U.S. Bureau of the Census, 1972).

Chapter V outlined the major hypotheses to be tested and the methodology to be used in the analysis. Chapter VI will show the results of testing and answer the questions in the major hypotheses.

FIGURE 6. POPULATION CONCENTRATION IN KUWAIT CITY

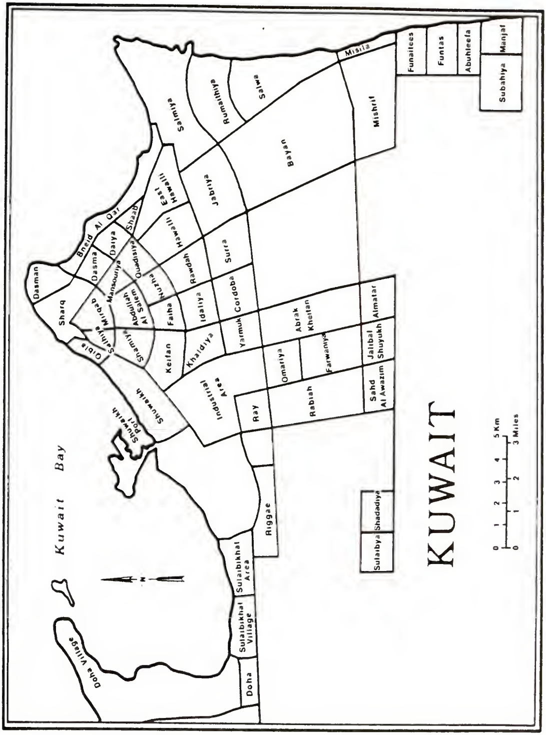
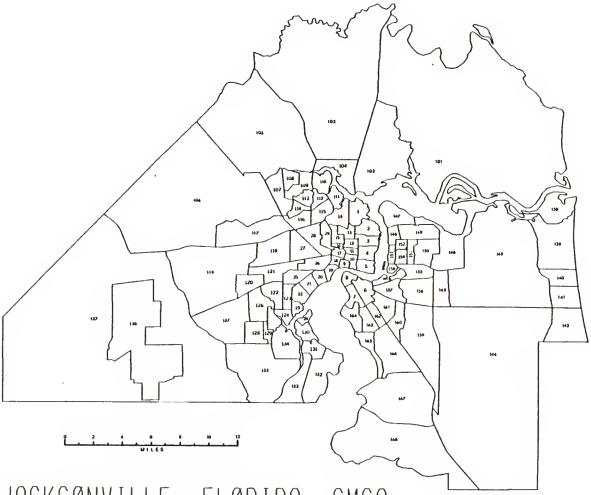

KUWAIT
Kuwait Bay
N
Doha Village
Doha
Sulaibikhat Village
Sulaibikhat Area
Riggae
Sulaibya
Shadadiya
Shuwaikh Port
Shuwaikh
Industrial Area
Ray
Qibla
Salhiya
Sharq
Dasman
Mirqab
Shamiya
Abdullah Al Salem
Mansouriya
Dasma
Bneid Al Qar
Daiya
Shaab
Qadisiya
Nuzha
Faiha
Keifan
Khaldiya
Idailiya
Rawdah
Hawalli
East Hawalli
Salmiya
Rumaithiya
Salwa
Jabriya
Surra
Cordoba
Yarmuk
Bayan
Mishrif
Misila
Funaitees
Funtas
Abuhleefa
Manqaf
Subahiya
Abrak Kheitan
Omariya
Farwaniya
Rabiah
Jalibal Shuyukh
Almatar
Sahd Al Awazim
0 1 2 3 4 5 Km
0 1 2 3 Miles

FIGURE 7. CENSUS TRACTS OF JACKSONVILLE



JACKSONVILLE, FLORIDA, SMSA

CHAPTER VI
FACTORIAL ECOLOGY OF KUWAIT CITY

The analysis of data of Kuwait City had two major steps. The first step was to factor analyze 40 variables, and the second was field checking the major dimensions and the spatial distribution of the factor scores. This chapter discusses the procedures followed in the analysis. They include the choice of variables, the choice of method of factor analysis, the choice of rotation method, and the resulting factors and factor scores.

The Variables

The initial analysis used 50 variables in four major groups, reflecting the main dimensions expected when using the factorial ecology method. These variables were:

Socio-economic variables. They include two subgroups, occupation variables and education variables.

Occupation variables. There were two types of occupational characteristics available. One showed the economic sector of activities in which the population is engaged, such as construction, industry, and commercial. The other is the type of profession or occupation for each individual, such as management, sales, or technical work.

a. First group

- Percentage of workers in agriculture and fishing (AGR)
- Percentqge of workers in mines and quarries (MIN)
- Percentage of workers in manufacturing (MANF)
- Percentage of workers in utilities (electricity, gas, and water) (UGW)
- Percentage of workers in construction (COSN)
- Percentage of workers in wholesale, retail, restaurants, and motels (WRRM)
- Percentage of workers in transportation (TRSP)
- Percentage of workers in insurance, real estate, and business services (IREB)
- Percentage of workers in social and personal services (SPS)

b. Second group

- Percentage of workers in technical occupations (TECH)
- Percentage in managerial occupations (MGR)
- Percentage in government (GOVT)
- Percentage in sales (SLS)
- Percentage in services (SERV)
- Percentage in agriculture (AGR)
- Percentage laborer (LBR)

The second group was chosen because the first group fails to discriminate between the levels of occupation with each activity. For example, construction activity contains occupations ranging from workers in loading and unloading of building materials to designers and engineers. However, the second group lacks some clarity and detail in some of its subgroups such as service personnel or sales people. But, the second group discriminates between high- and low-status occupations better than the first group. This discrimination by occupational variables is important for the present analysis because of the absence of income variables.

The second major group consists of five education variables:

- Percentage of illiterates (ILLIT)
- Percentage with education of less than 9 years (EDL9)
- Percentage with education of 9-11 years (ED9-11)
- Percentage with education of 12 years (ED12)
- Percentage with education of over 12 years (EDO12)

The illiterates variable assumes that those people have no ability to read or write. The second variable assumes the ability to read and write with formal education completed between zero and eight years. The third and fourth variables assume the completion of intermediate or secondary levels, and the fifth variable assumes some college experience.

Family characteristics. They include twelve variables:

- Percentage of persons per family (PPF)
- Percentage divorced (DIV)
- Percentage single (SING)
- Percentage widowed (WID)
- Percentage of women in labor force (WILF)
- Percentage male (MAL)
- Percentage of age 15 years and less (AL15)
- Percentage of age 15-24 years (A15-24)
- Percentage of age 25-49 years (A25-49)
- Percentage of age 50-64 years (A50-64)
- Percentage of age over 64 years (A064)
- Total number of population (POP)

Ethnicity variables. They include religious and nationality characteristics:

- Percentage of non-Muslims (NMUS)
- Percentage of non-Kuwaitis (NKUT)
- Percentage from Iraq (IRQ)
- Percentage from South Yemen (SYM)
- Percentage from Jordan (JORD)
- Percentage from Palistine (PLSN)
- Percentage from Syria (SRN)

- Percentage from Lebanon (LBN)
- Percentage from Egypt (EGPT)
- Percentage from other Arab countries (OAC)
- Percentage from Iran (IRN)
- Percentage from Pakistan (PAK)
- Percentage from India (IND)
- Percentage from other Asian and African countries (OAAC)
- Percentage from European and American countries (EAAC)

Housing characteristics. These include:

- Percentage living in apartments (APRT)
- Percentage living in villas (VLLA)
- Percentage living in traditional types of housing (TRAD)
- Percentage of owned units (OND)
- Mean number of rooms per unit (RPU)
- Mean number of persons per unit (PPU)

Housing variables were tried in the initial analysis but were omitted from the final analysis because they did not help to increase the total explained variation. With the inclusion of the housing variables, eight factors were extracted which explained 84.7 percent of the total variance. The first five factors explained 72.9 percent. On the other hand, with the elimination of the housing variables, eight factors were extracted which explained 82.3

percent of the total variance and the first five factors explained 74.2 percent.

The final set of variables used is shown in Table 5. The final variable set reflects variables from all of the groups except housing which was omitted from the final analysis. Moreover, the available data and the observations from the field work show the influence of the foreign labor force, more than 70 percent of the total labor force (al-Sabah, 1978), on the urban landscape and on the urban structure. Therefore, there are more variables chosen from this group than any set of variables to find out how these foreign groups affect the factorial ecology of Kuwait.

The analysis of the variables without the nationality variables produced four factors with the same socio-economic structure as with the inclusion of the nationality variables. However, the analysis of nationality structure explained the relationship between each nationality and the socio-economic and family characteristics and helped give a more thorough explanation to the general urban structure of the city.

Data Analysis

The computer program used in the analysis is the Statistical Analysis System (SAS) (Barr et al., 1976) factor analysis procedure. The method of factor analysis used is principal components analysis. The primary reason that

TABLE 5. THE VARIABLES USED IN THE FACTOR ANALYSIS OF KUWAIT CITY.

Variable Abbreviations	Population
POP	Total number of population
MAL	Percentage male
NKUT	Percentage of non-Kuwaitis
PPF	Persons per family
NMUS	Percentage of non-Muslims
AL15	Percentage age less than 15 years
A15-24	Percentage age between 15 and 24 years
A25-49	Percentage age between 25 and 49 years
A50-64	Percentage age between 50 and 64 years
A064	Percentage age over 64 years
ILLIT	Percentage of illiterates
EDL9	Percentage with formal education completed less than 9 years
ED9-11	Percentage with formal education completed 9-11 years
ED12	Percentage with formal education completed 12 years
EDO12	Percentage with formal education completed over 12 years
WILF	Percentage of women in labor force
UEMP	Percentage unemployed
DIV	Percentage divorced
WID	Percentage widowed
SING	Percentage single
TECH	Percentage of technicians
MGR	Percentage managerial
GOVT	Percentage in government
SLS	Percentage in sales
SERV	Percentage in service
AGR	Percentage in agriculture and fishing
LBR	Percentage laborers
IRQ	Percentage from Iraq
SYM	Percentage from South Yemen
JORD	Percentage from Jordan
PLSN	Percentage from Palestine
SRN	Percentage from Syria
LBN	Percentage from Lebanon
EGPT	Percentage from Egypt
OAC	Percentage from other Arab countries
IRN	Percentage from Iran
PAK	Percentage from Pakistan
IND	Percentage from India
OAAC	Percentage from other Asian and African countries
EAAC	Percentage from European and American countries

principal components analysis was chosen is that almost all previous analyses of factorial ecology have used this method. Thus, it is assumed that the results from the present study can be compared easily with other studies when there is a consistency in the method used in the analysis. And, since this study is built on the findings of previous studies, it was used here. However, several tests of several other methods were done. Although they showed some differences, they did not yield different general patterns of the ecological structure of Kuwait City. The most common characteristic among all these methods is the general importance of the foreign population in the factor structure.

The rotation used is the varimax rotation which is one of several methods of orthogonal rotation available. It was chosen here because it is the most commonly used method of rotation in previous studies.

The analysis produced eight factors, each with an eigenvalue greater than 1.0. The eight factors explained about 84 percent of the total variance. However, only five factors, explaining 74 percent of the variance, seemed to be of great importance to the study. Each of the last three factors is a unique factor, that is, each has a high loading for only one variable. Factor VI has a high loading in percentage of population from other Arab countries (.75436). Factor VII has a high loading in the percentage of population from other Asian and African countries (.84884). Factor VIII has a high loading in the percentage of population aged between 50-64 years.

Explanation of the factor loadings, which show the strength of the relationship between each variable and each factor, had the problem of the lack of a standard role. Within the literature, different studies have followed different methods. Although the most common rule is to use ±0.7 as the point separating significant and insignificant loadings, several studies used loadings as low as ±0.4. In this study a subjective classification of loadings is imposed:

Loading	Strength of Relationship
> |0.7| but	Very strong
> |0.6| but < |0.7|	Strong
> |0.4| but < |0.6|	Weak

The Factor Pattern

This section describes the general character of each factor and gives each a name. Also, it will explain the spatial structure of the factor scores.

Factor I: Low Socio-Economic Status

The first factor explains 27.6 percent of the total variance accounted for by all the variables. It has four variables having loadings of more than |0.7| and eight variables with loadings more than |0.6| is shown in Table 6. These strong relationships between the eight variables and Factor I represent all three major groups of variables. Most of these variables reflect lower status conditions. Therefore this factor will be labeled "Low Socio-Economic Status." From the socio-economic group there is high positive relationship with ILLIT (.67017), and negative relationship with the medium levels of education EDL9 (-0.88194), and ED9-11 (-0.77560).

With regard to occupational characteristics, three loadings should be mentioned. First, there is a high negative relationship between the GOVT and Factor I (-0.88203). The explanation of this situation is related to the fact that a large proportion of the workers in industries which had high positive loadings on this factor work in the private sector, especially in the construction part. Second, there is a high positive relationship between this factor and the AGR (0.52741). Third, there is a weak relationship with LBR (.43347). These two variables represent the lowest occupational status among the seven occupations in Table 5. This conforms to the general character of this factor.

The variables from the second group show a very stable marital status in which DIV is negatively related to this factor (-0.66117) as is WID (-0.51775). However, the most important variable in this factor seems to be MAL which

TABLE 6. MAJOR LOADINGS ON FACTOR I.

Variable Abbreviations	Variable	Loading
ILLIT	Percentage of illiterates	0.67017
EDL9	Percentage with education of less than 9 years	-0.88194
ED9-11	Percentage with education of 9-11 years	-0.77560
GOVT	Percentage of workers in government	-0.88203
AGR	Percentage of workers in agriculture and fishing	0.62471
LBR	Percentage laborers	(.43347)*
MAL	Percentage male	0.83035
PPF	Persons per family	-0.67427
DIV	Percentage divorced	-0.66117
AL15	Percentage age less than 15 years	(-0.44670)
A25-49	Percentage age 25-49 years	(-0.50533)
A064	Percentage age over 64	(-0.51775)
IRQ	Percentage from Iraq	(0.59437)
SRN	Percentage from Syria	(0.54173)
IRN	Percentage from Iran	(0.43422)

*Loadings in parentheses are those with weak relationship.

has a high positive loading (0.83035). There are at least three reasons for this high value. First, some of the foreign groups related to this factor entered the country illegally. All are assumed to be males who enter the country without their families shown in the number of cases involving illegal aliens arrested (al-Sabah, 1978). Second, the distance between Kuwait and the major southern town of Iraq is very short. This makes it easier to leave a family and yet return to visit frequently. Third, the costs of living in Kuwait are much higher than those in Iran, Syria, or Iraq. Therefore, these workers avoid bringing their families with them. Consequently, not all these males have the social characteristics of single persons. The difference could be attributed to the fact that a large proportion of the immigrant population is married, and these people are so reported in the census.

Age also shows a pattern which conforms to the general characteristics of this factor. There is a tendency, although not strong, for the population to be from the age group 25-49 years (.50533). This is the age group in which immigrants with no education and work in occupations which require some physical abilities would be expected to be found. Moreover, there are weak negative relationships with age group of less than 14 years (-0.44570) and age group of over 64 years (-0.51462).

From the third group, no variable loads strongly in this factor. This could mean two things: first, there is no dominance of a specific foreign group in this factor and the areas it represents; or, second, part of the low-economic status Kuwaiti population intermixes with foreign groups, particularly since the loading of NKUT is very low in this factor (0.27296). Generally speaking there are three loadings with weak relationships related to three nationalities: IRQ (0.59437, SRN (0.54173), and IRN (0.43422).

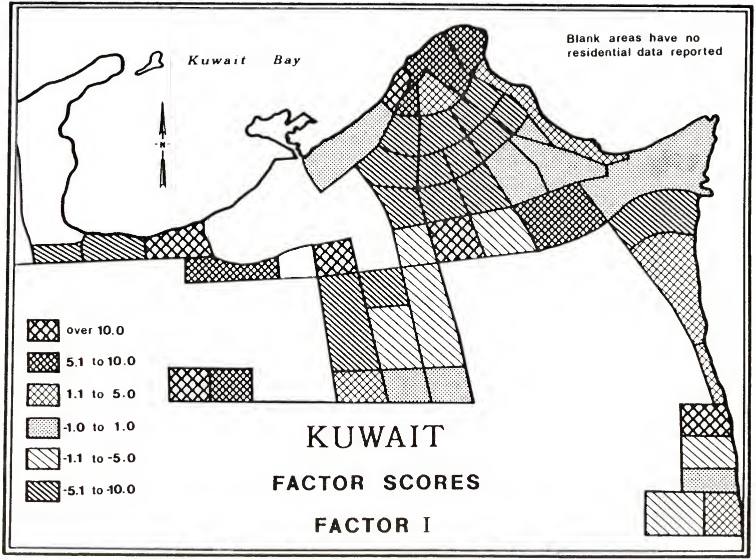
Factor I: Factor Scores

The distribution of the factor scores for Factor I shows five distinct patterns (Fig. 8).

1. Low positive factor scores (1.0 to 5.0) indicate that the areas within this class show a tendency toward having low status socio-economic characteristics, and, at the same time, intermix with other different types of charactertistics. They do not have a well-defined spatial pattern, and they scatter in different parts of the city.

One of the largest areas in this group is Bneid Al Qar in which there is an intermixing of low and high grades of housing types. Usually the interior of each huge block, in the areas of early development, will contain low-grade housing types, such as the traditional

FIGURE 8. FACTOR SCORES FOR FACTOR I


Kuwait Bay
N
Blank areas have no residential data reported
over 10.0
5.1 to 10.0
1.1 to 5.0
-1.0 to 1.0
-1.1 to -5.0
-5.1 to -10.0
KUWAIT
FACTOR SCORES
FACTOR I

local type with no open space and continuous built-up area. This area is walled by better-grade units facing the main streets.

This area has an unusual shape and size. It stretches from the old city, along the Arabian Gulf, to Salmiya. The most important highway in Kuwait, the Arabian Gulf Road, passes along Bneid Al Qar. Its location on the gulf coast led to faster development and changing the land uses facing the highway than that of the interior where large parts of the low economic status areas remain in the same initial condition. Furthermore, the gulf area is in the process of change and redevelopment. Some of the traditional, government-built or privately built units are changing to modern villas or small apartment buildings, benefiting in this manner from government loans.

Mirqab, located within the old city, is another area within this group. Generally speaking, after the flow of huge oil revenues in the late fifties and sixties, the families with higher incomes left the old city for the suburbs. The only ones left in the city are the low-income families and non-Kuwaitis.

Although this area and other areas in the old city show a spread of Factor I in every census area, this only reflects the trend in the 1975 census. This may not hold if the same analysis is done with the 1980 data. During the five years between 1975 and 1980 most of the old city traditional-housing areas were cleared, and new office and residential apartment buildings began to spread. Even the government participated in redevelopment by building its new complex of ministries in this section of the old city, in addition to the many government buildings spread throughout all parts of the old city.

Other areas within this group are Salwa, Manjaf, and Sahd Al Awazim. These areas, especially the first two, are relatively newer areas. These are characterized by the existence of some sections with traditional housing units. Sahd Al Awazim is characterized by the existence of a large proportion of the Bedouis population which has a low-economic status.

2. High positive factor scores (5.1 to 10.0) reflect a relatively high representation of Factor I. There are two major trends in the spatial characteristics of this factor. One is the concentration of high-factor scores in the old city which is anticipated to be influenced by the redevelopment process that took place after 1975. The second is the existence of dispersed areas outside the old city. Jabriya and Rigga are two areas with middle and low-middle class characteristics. Shaddadiya is an area of Bedouin concentration with low-economic status.

3. Very high factor scores (over 10.0) include areas with the highest representation of this factor.

They show three major trends. First, there is one concentration in the old city in the area of Qibla. Second, there are areas which were under construction when the census was taken; these included the characteristics of the workers rather than the residents who came shortly after the census period. This is the case of the suburban community of Cordoba. Third, there are areas which are characterized by very low status which include Sulaibkhat Area,* Salibiya, Ray, and Funaitees. Actually, in places such as Salibiya, the residential type was shantytown at the time of the census. Recently, new low-income residential units were built by the government and these were given to the residents of the shantytowns. Generally, the residents in these areas are Bedouins.

4. High negative scores (-1.1 to -5.0) include areas with the general deviation from behavior of this factor. As shown in Figure 8, these scores are in areas located in the southern fringe of the city in the areas of Farwaniya, Abrak Kheitan, Yarmuk, Surra, and Funtas. These high negative scores mean that there are groups with characteristics other than those of Factor I also existing in these areas. This is true in the areas of

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*Two areas identified in the census have the same name (Sulaibkhat), but one is known as Sulaibkhat Area, and the other as Sulaibkhat Village.

Farwaniya, Abrak Kheitan, and Funtas, but in the suburbs of Yarmuk and Surra, temporary workers seem to have some effect.

5. Low negative factor scores (-5.1 to -10.0), represent a strong negative deviation from the general behavior of this factor. This group includes all the suburban communities south of the old city and west of Hawalli. These areas are characterized by the existence of relatively better status groups, and they are modern, well-planned suburbs. Unexpectedly, this group included the areas of Sulaibkhat Village and Doha. The type of housing structures shows these two areas as having a large proportion of low economic status groups. Two elements might have produced this unexpected pattern. First, these areas contain a more modern development and higher economic status along their boundaries facing all the main streets, while smaller traditional units are walled inside. Second, at the time of the census this area could have had higher economic status development, particularly since there exists an abandoned older complex in Sulaibkhat Village which was housing doctors and highly placed technicians from the hospitals in that area.

Factor II: High Socio-Economic Status

The second factor explains 20.8 percent of the total variance among all the variables. It has three variables with loadings more than |0.7| and seven variables with loadings more than |0.6|, as is shown in Table 7. These strong relationships include variables from all three main groups, the same pattern as is found in Factor I.

The major loadings generally reflect high-status conditions. These include both Kuwaiti and non-Kuwaiti population. The foreign population, however, includes the non-Muslim population in general and also persons from European and American countries.

From the socio-economic group there is a strong negative relationship between this factor and ILLIT (-0.68218). Moreover, while there is a weak positive association between the ED9-11 and this factor (0.45259), the strongest educational correlations are with ED12 (0.90554) and ED012 (0.89709).

This advanced educational pattern is reflected in the occupational structure. The highest loadings with regard to occupation are found in the highest levels within the seven occupation groups. These are TECH (0.81773). and MGR (0.66859). These occupations have a higher status in the industrial, health, government, and business sectors.

From the group of family variables there is one variable, WILF, which is highly loaded in this factor (0.83701). Women are mainly employed in secretarial positions in both the government and private sectors.

TABLE 7. MAJOR LOADING ON FACTOR II.

Variable Abbreviation	Variable	Loading
ILLIT	Percentage of illiterates	-0.68218
ED12	Percentage with education of 12 years	0.90554
EDO12	Percentage with education over 12 years	0.89709
TECH	Percentage of technicians	0.81773
MANG	Percentage managerial	0.66859
UEMP	Percentage unemployed	(-0.4895)*
WILF	Percentage of women in labor force	0.83701
AL15	Percentage of age less than 15 years	(-0.49379)
A25-49	Percentage of age 25-49	(0.43732)
SING	Percentage single	(0.52139)
NKUT	Percentage of non-Kuwaitis	(0.47047)
NMUS	Percentage of non-Muslims	0.66685
IND	Percentage from India	(0.54423)
EAAC	Percentage from European and American countries	0.66641

*Loadings between parentheses are those with weak relationship.

Also, there are three variables with a weak relationship to this factor. Within age groups, there is a tendency toward having a smaller number of persons with AL15 (-0.49399). On the other hand there is a tendency to have more persons in the age group 25 to 49 years (0.43732). Moreover, there is a tendency toward having more single persons in areas where this factor is found (0.52139).

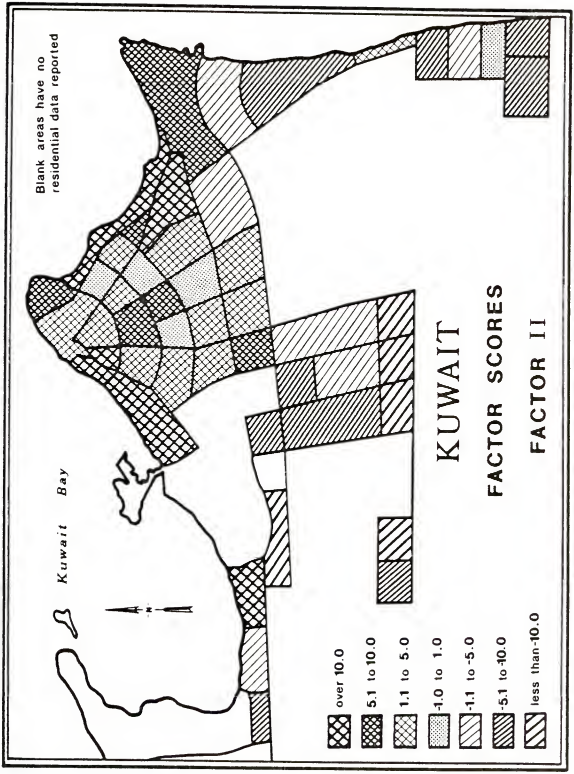
From the ethnicity group there are two variables which are highly loaded on this factor. These are NMUS (0.66685) and EAAC (0.66641). Moreover, there are two more variables with weak loadings: NKUT (0.47047) and IND (0.54423).

Factor II: Factor Scores

The distribution of the factor scores for this factor shows five distinct patterns (Fig. 9).

1. Low positive scores (1.0 to 5.0) mean that the areas within this class show a tendency toward having a higher socio-economic status, and at the same time intermix with other types of characteristics. These scores exist mainly in the suburbs except in the case of Mirqab. These areas include Mansouriya, Shamiya, Daiya, Keifan, Khaldiya, Idaliya, Cordoba, Surra, Hawalli, and Misila. Although most of these areas were built for middle and high-middle economic status populations, this

FIGURE 9. FACTOR SCORES FOR FACTOR II


KUWAIT
FACTOR SCORES
FACTOR II
Kuwait Bay
N
Blank areas have no residential data reported
over 10.0
5.1 to 10.0
1.1 to 5.0
-1.0 to 1.0
-1.1 to -5.0
-5.1 to -10.0
less than -10.0

slightly moderate deviation was caused mainly by the existence of low-income housing, especially in the older suburbs such as Keifan and Faiha.

2. High positive factor scores (5.1 to 10.0) reflect a high concentration of the characteristics of this factor. As shown in Figure 9, there are few areas in this group. However, they have two major trends. One is represented in Dasman which contains the two largest embassies, the United States Embassy and the British Embassy. Each is surrounded by many modern residential units which house embassy employees. This is one of the main reasons that percentage of European and American population loads highly in this factor.

The second trend is represented by the suburban communities of Abdulla Al Salem, Nuzha, and Yarmuk. These communities are the most exclusive areas in the city of Kuwait where the high socio-economic status population lives. Further, these areas contain a very small number of foreigners.

3. Very high positive factor scores (over 10.0) reflect a very high concentration of the characteristics of this factor. As the previous group was mainly made up of Kuwaiti population, more foreign population tends to live in the areas having factor scores this high.

In Sulaibkhat Area and Shuwaikh there is a somewhat large proportion of foreign population with higher status occupations. The area between Shuwaikh and Sulaibkhat is an area where all major hospitals, major technical colleges, and the major campus of the University of Kuwait are located. There are large residential complexes in Shuwaikh and Sulaibkhat which were built to house the people working in these places.

Within the old city, there are two areas which belong to this group. Qibla and Salhiya are characterized by the existence of many new, modern buildings which contain offices and shops in the first two or three floors and residential apartments in the rest of the buildings. These modern buildings attracted foreigners with higher occupational status.

Outside the walled city, there are two areas, Bneid Al Qar and East Hawalli. These are areas which have developed relatively earlier than the other modern suburbs already mentioned. Both areas contain a large proportion of foreign population, and since the redevelopment that took place in these areas included the development of modern and expensive apartment buildings, the rent is only afforded by that certain group with higher occupational status.

4. High negative factor scores, as shown in Figure 6, are areas located next to the areas with moderate or strong

positive deviation. These areas in this group are represented by moderate deviation because of the influence of the adjacent better areas. Moreover, the areas of this group work as a zone of transition between two different ecological patterns. For example, the strip of Rumaithiya, Jabriya, Abrak Kheitan, Farwaniya, and Sulaibkhat Village form a boundary zone between the modern suburbs to the north and the lower economic status suburbs to the south and west.

5. Low negative factor scores (-5.1 and over) represent a strong negative deviation from the usual mean of this factor. These areas are located toward the edge of the city, particularly in the areas which contain a large proportion of Bedouins.

Factor III: Jordanians and Palestinians

The third factor explains 13.7 percent of the total variance accounted for by all the variables. It has three variables with loadings over |0.7| and four variables with loadings over |0.6|, as shown in Table 8.

Table 7 shows no strong relationship between this factor and any of the groups other than ethnic characteristics. However, the population variable (number of people in the census area) loads strongly in this factor (0.83036). From the ethnicity group there is a strong association with JORD (0.90262), the PLSN (0.86365), and LBN (0.65005), in addition to the weak correlation with NKUT (0.57444).

TABLE 8. MAJOR LOADINGS ON FACTOR III.

Variable Abbreviation	Variable	Loading
POP	Population	0.83036
SERV	Percentage of workers in services	(-0.42425)*
A15-24	Percentage age 15-24 years	(-0.57002)
A064	Percentage age over 64 years	(-0.40747)
SING	Percentage single	(-0.51651)
NKUT	Percentage of non-Kuwaitis	(0.57444)
JORD	Percentage from Jordan	0.90262
PLSN	Percentage of Palestinians	0.96365
LBN	Percentage of Lebanese	0.65005

*Loadings between parentheses are those with weak relationship.

This variable was labeled "Jordanians and Palestinians" because of the importance of these two groups, with the Lebanese, in the urban structure of the city. In 1975 there were 31,405 Palestinians, 172,773 from Jordan, and 24,776 from Lebanon. These are 3.1 percent, 17.3 percent, and 2.5 percent of the total population, respectively. Slight movement before and heavy migration after the Five-Day War (1967) brought Palestinians from the West Bank and other areas to Kuwait where good job opportunities were available.

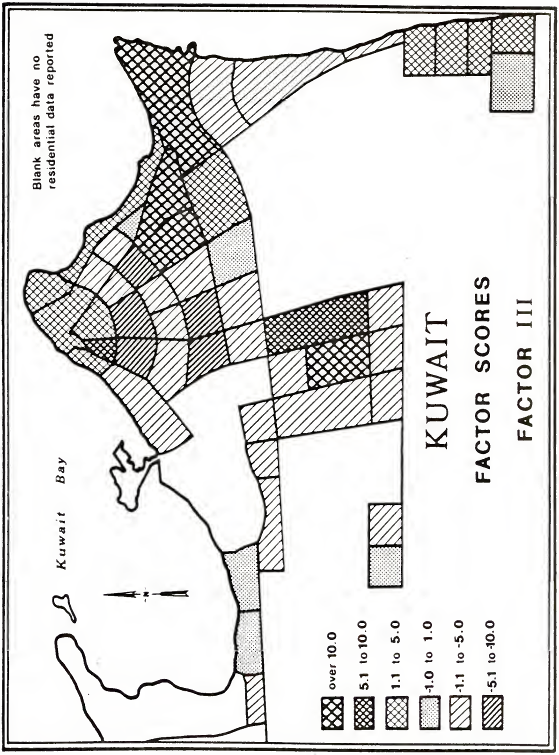
Of the Jordanians, although some of them are actually of Jordanian origin, a much larger proportion is of Palestinian origin and obtained Jordanian nationality after the 1948 war. Generally, the three ethnic groups form a single group with similar cultural characteristics.

From the socio-economic group there is a weak negative association with workers in services; and, if the population variable in this group is considered, it has a strong association with Factor III. The reason for the existence of this variable with the three ethnic groups is that the areas where these groups live contains more apartment buildings than single-family units. This causes the total population to be greater than in the other areas.

Factor III: Factor Scores

The distribution of the factor scores for this factor shows four patterns, as shown in Figure 10.

FIGURE 10. FACTOR SCORES FOR FACTOR III


KUWAIT
FACTOR SCORES
FACTOR III
Kuwait Bay
N
Blank areas have no residential data reported
over 10.0
5.1 to 10.0
1.1 to 5.0
-1.0 to 1.0
-1.1 to -5.0
-5.1 to -10.0

1. Low positive scores (1.0 to 5.0) have two major spatial trends. First, this class prevails in all areas of the old city except Salhiya. The second trend is the dispersion of this class in few areas outside the old city. These are Bneid Al Qar, Jabriya, Manjaf, Funtas, and Abu Haleefa.

2. High factor scores (5.1 to 10.0) reflect a relatively high presence of Factor III. There are only two areas that belong to this class: Salhiya in the old city and Abrak Kheitan outside the old city.

3. Very high factor scores (over 10.0) show two major concentrations. One is in the Hawalli, East Hawalli, and Salmiya concentrations and the other is in Farwaniya.

Hawalli has the largest population concentration in the city with about 130,665 persons in 1975. Only 7.5 percent of them are Kuwaitis and 92.5 percent are non-Kuwaitis. The Jordanians form more than 50 percent of the total population of this area, while the Palestinians and Lebanese form only 15 percent.

Salmiya is the modern suburb of the non-Kuwaitis. It also has a high concentration of population (113,943) with 85 percent non-Kuwaitis. Of the total population, 28 percent are Jordanians, 9 percent Palestinians, and 6 percent Lebanese.

East Hawalli is a smaller community, with only 22,414 persons, but with high concentration of foreign population.

Of the total population 92 percent are non-Kuwaitis. Moreover, 36 percent are from Jordan, 6 percent are Palestinians and 7 percent are Lebanese.

4. Negative scores (-1.1 and less) are spread throughout all of the other areas of Kuwait City.

Factor IV: Middle Status Foreign Population

The fourth factor explains 6.7 percent of the total variance accounted for by all the variables. It has four variables with loadings more than $|0.7|$. These strong loadings reflect ethnic characteristics with the exception of one variable which reflects occupational characteristics as shown in Table 9. This factor is labeled "middle status foreign population." The reason for labeling this factor as middle SES is the position of the variable describing this factor with regard to technical and managerial occupations in Factor II and occupation with low experience in the next factor.

From the socio-economic group there is only one variable highly related to this factor. This is SLS (0.75850).

From the family group there is only one variable, A25-49 with a weak positive relationship with Factor IV (0.51739).

From the ethnicity group there are high relationships with SYM (0.72078), PAK (0.79610), and IND (0.75206).

TABLE 9. MAJOR LOADINGS ON FACTOR IV.

Variable Abbreviations	Variable	Loading
SAL	Percentage of workers in sales	0.75850
A25-49	Percentage age 25-49 years	(0.51739)
NMUS	Percentage of non-Muslims	(0.53720)
SYM	Percentage from South Yemen	0.72078
EGPT	Percentage from Egypt	(0.50128)
PAK	Percentage from Pakistan	0.79610
IND	Percentage from India	0.75206

*Loadings between parentheses are those with weak relationship.

The relationship between selling and this ethnic structure can be explained by the existence of a section in the remaining part of the old commercial center within the city center, dominated by sellers from South Yeman. They sell mainly ready-to-use traditional clothes and leather products all of low quality. In addition, within the modern commercial center, certain portions are dominated by Indians and Pakistanis.

The existence of a weak relationship with NMUS (0.53720) is found as a result of the Indians variable. Moreover, there is a weak relationship with EGPT (0.50.28).

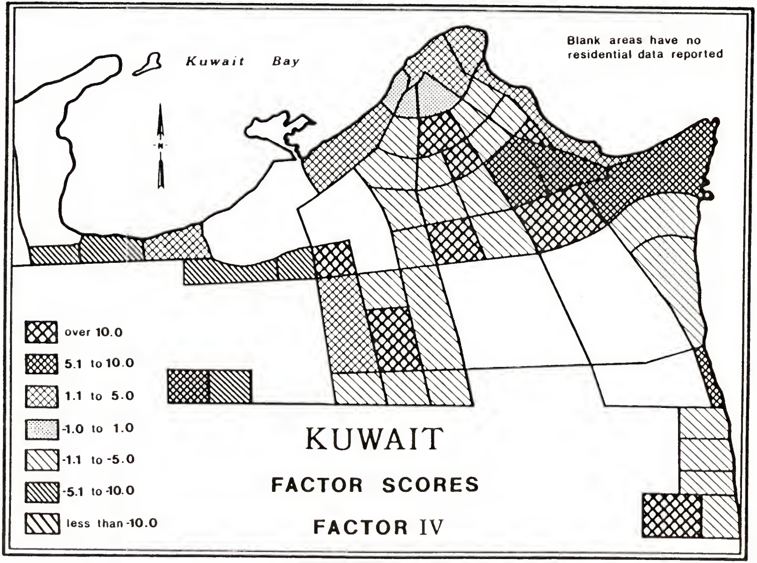
Factor IV: Factor Scores

The distribution of the factor scores for this factor shows four distinguished patterns, as shown in Figure 11.

1. The low positive scores (1.0 to 5.0) have two major spatial trends. First is the absence of this class from the old city. Second is the existence of this factor in the area of Hawalli, East Hawalli and Salmiya. Also, this class includes Misila and Salaibiya.

2. The high positive scores (over 5.0) have three major spatial patterns. First, there is a high concentration of this class in the old city, especially in the western section in the areas of Qibla, Salhiya, and Mirqab. Second, outside the old city, the concentration of this class is in the older suburbs such as Bneid Al Qar, Shuwaikh,

FIGURE 11. FACTOR SCORES FOR FACTOR IV


Kuwait Bay
N
Blank areas have no residential data reported
KUWAIT
FACTOR SCORES
FACTOR IV
over 10.0
5.1 to 10.0
1.1 to 5.0
-1.0 to 1.0
-1.1 to -5.0
-5.1 to -10.0
less than -10.0

and Sulaibkhat Area. Third, there is only one area in the edge of the city in this class, Rabiah. The common element among all these areas is the high concentration of apartment buildings in them.

3. High and low negative factor scores (less than -1.0) are spread in all the new suburbs of either high- or low-economic status which correspond to high and low factor scores respectively.

Factor V: Low Status Foreign Population

The fifth factor explains 5.4 percent of the total variance. It has two variables with loadings more than |0.7| and three variables more than |0.6|, as shown in Table 10.

Because of the type of occupation prevailing in this factor, it is labeled "low status foreign population." The word "foreign" does not mean that this factor does not contain Kuwaiti population. On the contrary, the loading for the NKUT variable (0.32811) suggests, indirectly, the existence of a mixture of Kuwaiti and non-Kuwaiti population. The word was included mainly because this factor has a high loading for a foreign group and as a way to differentiate this factor from Factor I.

From the socio-economic group there is a strong negative relationship between this factor and SERV (-0.74331) and a strong positive loading by LBR (0.72105).

TABLE 10. MAJOR LOADINGS ON FACTOR V.

Variable Abbreviations	Variable	Loading
UEMP	Percentage unemployed	(-0.58050)*
SERV	Percentage of workers in services	-0.74331
LBR	Percentage of laborer no experience	0.72105
AL15	Percentage age less than 15 years	(-0.40859)
A25-49	Percentage age 25-49 years	(0.42144)
DIV	Percentage divorced	(-0.41835)
WID	Percentage widowed	(-0.49935)
IRQ	Percentage from Iraq	(0.49915)
IRN	Percentage from Iran	0.64958

*Loadings between parentheses are those with weak relationship.

Moreover, there is a weak negative relationship with the unemployment variable (-0.58050).

From the family group there are no strong relationships with this factor; however, four variables showed weak loadings. These are AL15 (-0.40858), A25-49 (0.42122), DIV (-0.41835), WID (-0.49935).

The loadings of these two groups suggest that although this factor represents low economic status population, it relates negatively to the major indicators of social problems. On the other hand, in Western cities the relationship tends to be positive.

From the ethnicity group there is a strong correlation with IRN (.64958). Iranian workers are employed mainly in the construction industry. Moreover, there is a weak correlation with the variable IRQ (0.49915). The Iraqi workers tend to engage in the same occupations as do the Iranians.

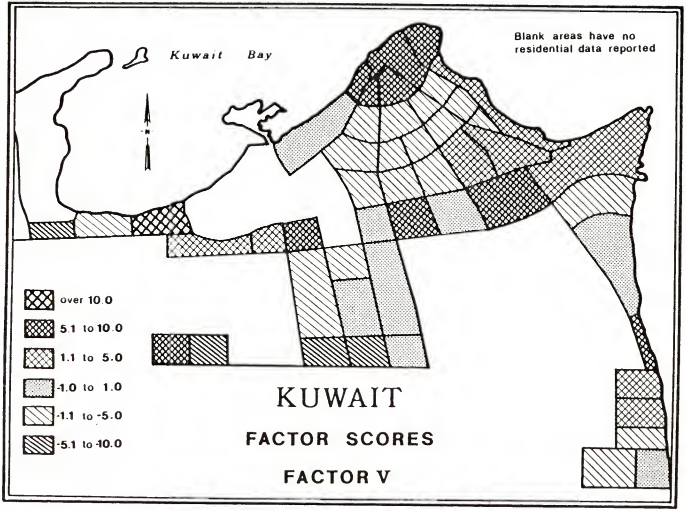
Factor V: Factor Scores

The distribution of the factor scores for this factor shows four distinct patterns, as shown in Figure 11.

1. Low positive factor scores (1.0 to 5.0) are characterized by their concentration in the older suburbs of Bneid Al Qar, Hawalli, East Hawalli, and Salmiya.

2. High positive factor scores (over 5.0) show two main trends. One is the existence of low-status population

FIGURE 12. FACTOR SCORES FOR FACTOR V


Kuwait Bay
N
Blank areas have no residential data reported
over 10.0
5.1 to 10.0
1.1 to 5.0
-1.0 to 1.0
-1.1 to -5.0
-5.1 to -10.0
KUWAIT
FACTOR SCORES
FACTOR V

in all the major areas within the old city. They tend to live in the older apartment units which usually are very small, with a high density of persons per unit. The other trend is the dispersion of some areas of the suburbs. These include Jabriya, Cordoba, Ray, Misila, Slaibiya, and Sulaibkhat Area.

With regard to Jabriya, Misila, and Sulaibkhat Area, they include a section with low-income areas. Ray is an industrial section with a very small residential section housing low-status workers. Slaibiya is in this class, perhaps because it has some Bedouins from Iraq. Finally, Cordoba, a middle-class suburb, is found in this class because at the time of the census there were large numbers of construction workers who lived in temporary structures near their work.

3. High negative factor scores (-1.0 to -5.0) include all the modern suburbs. This is unexpected pattern, as these areas were expected to show very low negative scores. The explanation of this situation is that within these middle and higher economic status suburbs live a large number of housekeepers.

4. Low negative factor scores (less than -5.0) include the low-income areas on the edge of the city.

Summary and Conclusions

From the factor analysis of the 40 variables, eight factors with eigenvalues greater than 1.0 were produced and only five factors explaining 74.2 percent of the total variables were used in this study. The analysis of these factors showed the following patterns:

1. There is no separation between the three major groups of variables. There are always at least two groups with high loadings in each factor. Table 11 shows that socio-economic characteristics seem to be a common element in all the five factors. The next most frequent is ethnic characteristics with only one weak loading. Finally, the family characteristics group has strong loadings in only two factors.

2. Within the socio-economic group, Table 12 shows that occupation plays an important role in the formation of the major factors. Each factor is strongly related with at least one variable among the occupational characteristics.

3. Educational characteristics load strongly in only the first two factors. They do not load either strongly or weakly in any of the other three factors. Factor I is related strongly to variables showing low educational status, whereas Factor II correlates strongly with variables showing high educational status, as shown in Table 13.

4. The loadings of ethnic variables are related to occupational status. This is one of the main reasons that

TABLE 11. SUMMARY OF THE RELATIONSHIP BETWEEN EACH FACTOR AND EACH GROUP OF VARIABLES.

Factor	Socio-Economic	Family	Ethnic
I	S_5	S_3	W_3
II	S_5	S_1	S_2
III	S_1	W_3	S_3
IV	S_1	W_1	S_3
V	S_2	W_4	S_1

S = The existence of strong loadings (over $|.6|$)
W = The existence of weak loadings only (less than $|.6|$)

The subscript indicates the number of variables in each major group with strong or only weak loadings.

TABLE 12. THE RELATIONSHIP BETWEEN THE MAJOR FACTORS AND OCCUPATION VARIABLES.

Factor	Workers in Agriculture and Fishing	Laborer	Workers in Government	Technicians	Managerial	Workers in Services	Workers in Selling	Unemployed
I	S	W	S					
II				S	S			W
III						S		
IV							S	
V		S				S		W

S = The existence of strong loadings (over |.6|).
W = The existence of weak loadings only (less than |.6|).

TABLE 13. THE RELATIONSHIP BETWEEN THE MAJOR FACTORS AND EDUCATION VARIABLES.

Factor	Illiterate	Education Less Than 7 Years	Education 9 Years	Education 12 Years	Education Over 12 Years
I	S	S	S		
II	S			N	N
III					
IV					
V					

S = The existence of strong loadings (over |.6|).
W = The existence of weak loadings only (less than |.6|).

the Iraqi population loaded in two factors with different occupational characteristics, as shown in Table 14. The same situation holds for the Iranian variable, too. Moreover, the Indian variable explains this point more clearly. There are two loadings. One has a weak relationship with Factor II, which represents higher status characteristics. The other has a strong loading on Factor IV which is a medium economic status characteristic.

5. Although there were eleven variables reflecting family characteristics, only two factors showed at least one strong loading, as shown in Table 15. Factor I contains strong relationships with variables reflecting low socio-economic status, while Factor II is loaded strongly by only one variable, women in labor force, which could be used as an indicator of higher status conditions. The rest of the factors show only weak relationships with the family variables.

From the general conclusions, one may infer that in the city of Kuwait there are two major factors which explain the residential differentiations. One factor reflects low socio-economic status, and the other reflects higher socio-economic status. Additional factors seem to exist only because of the special case of the foreign population structure.

With respect to the spatial implication of these factors, one may conclude that there are four major, spatially differentiated residential structures.

TABLE 14. THE RELATIONSHIP BETWEEN THE MAJOR FACTORS AND ETHNIC VARIABLES.

Factor	From Iraq	From Syria	From Iran	From India	From European and American Countries	From Jordan	Palestinians	From Lebanon	From South Yemen	From Egypt	From Pakistan	Non-Kuwaitis	Non-Muslims
I	W	W	W										
II				W	S							W	S
III						S	S	S				W	
IV				S					S	W	S		W
FV	W		S										

S = The existence of strong loadings (over |.6|).
W = The existence of weak loadings only (less than |.6|).

TABLE 15. THE RELATIONSHIP BETWEEN THE MAJOR FACTORS AND FAMILY CHARACTERISTICS.

Factor	Per- cent Male	Percent Persons Per Family	Percent Divorced	Percent Widowed	Percent Single	Percent Age Less Than 14 Years	Percent Age 14-24 Years	Percent Age 25-49 Years	Percent Age 50-64 Years	Percent Age Over 65 Years	Percent Women In Labor Force
I	S	S	S	W		W		W		W	
II					W	W		W			S
III					W		W			W	
IV								W			
V			W	W	W			W			

S = The existence of strong loadings (over $|.6|$).
W = The existence of weak loadings only (less than $|.6|$).

1. The old city, which includes the areas of Qibla, Salhiya, Mirqab, Sharq, and Dasman. These areas showed a mixture of residential characteristics as a result of the mixture in the pattern of land use. This land use ranges from small, old traditional housing units, which existed during the 1975 census, to new, modern apartment units. With the mixture of the redeveloped and old areas, it is hard to define a special spatial pattern within this area.

2. The older suburbs include the coastal communities of Bneid Al Qar, Hawalli, East Hawalli, and Salmiya. These communities are characterized by the existence of a mixture of nationalities, socio-economic, and family characteristics.

3. Higher economic status communities include the modern suburban communities surrounding the older suburbs. This includes the communities of Dasma, Mansouriya, Abdullah Al Salem, Shamiya, Keifan, Faiha, Nuzha, Qadisiya, Daiya, Khaldiya, Idaliya, Rawdah, Surra, Cordoba, and Yarmuk.

4. Low economic status areas include most of the communities located in the fringes of the urbanized area. This includes the communities of Sulaibkhat Village, Doha, Slaibiya, Shaddadiya, Sahd Al Awazim, Jaleeb Al Shyoukh, and Farwaniya.

A general conclusion from the distribution of factor scores for the five factors is that the residential structure of Kuwait City, depending on the analyzed variables, can be identified in three main patterns:

1. Two areas of mixed low and high economic status population, one area including the old city, and the other area including the older suburbs;

2. High economic status areas located in the modern suburbs; and,

3. Low economic status suburbs which include the newly built area for low-income families supported by the government.

In this chapter an attempt was made to answer the questions, presented in the hypotheses section, with regard to the factorial ecology of Kuwait City. In the next chapter the same attempt will be tried on Jacksonville.

CHAPTER VII
FACTORIAL ECOLOGY OF JACKSONVILLE

As in Kuwait City, there were two steps in the analysis of the data of Jacksonville. The first step was a factor analysis on 45 variables, and the second step was field work to check the major dimensions and the pattern of spatial distribution of the factor scores. This chapter will discuss the processes followed in the analysis, including the choice of variables, the choice of the factor analysis method, the choice of rotation, and the pattern of the resulting factors and factor scores.

The Variables

The initial and final analyses used 45 variables in the same four major groups used in Kuwait City. These variables are:

Socio-economic variables. They consist of three subgroups. First are occupation variables which include the following:

- Percentage unemployed (UNEMP)
- Percentage in professional occupations (PROF)
- Percentage in managerial occupations (MANG)
- Percentage in sales (SAL)
- Percentage in farming (FRM)

- Percentage in clerical occupations (CLRL)
- Percentage in transportation (TRSP)
- Percentage in labor occupations (LABR)
- Percentage in services (SRV)

Second, education variables include four types:

- Percentage school years completed is zero (SCHZ)
- Percentage school years completed 1 to 8 (SCH1-8)
- Percentage school years completed 9 to 12 (SCH9-12)
- Percentage school years completed over 12 (SCHO12)

Third, income variables include eight categories:

- Percentage income less than $2,000 (INC <2000)
- Percentage income $2,000 to $4,000 (INC 2-4000)
- Percentage income $4,000 to $6,000 (INC 4-6000)
- Percentage income $6,000 to $8,000 (INC 6-8000)
- Percentage income $8,000 to $10,000 (INC 8-10000)
- Percentage income $10,000 to $15,000 (INC 10-15000)
- Percentage income $15,000 to $25,000 (INC 15-25000)
- Percentage income $25,000 and over (INC 0 25000)

Family characteristics. They include nine variables:

- Percentage age less than 14 years (A < 14)
- Percentage age 14-24 years (A 14-24)
- Percentage age 25-44 years (A 25-44)
- Percentage age 45-64 years (A 45-64)
- Percentage age over 64 (AO 64)
- Percentage of women in labor force (WILF)

- Percentage single (SNG)
- Percentage widowed (WID)
- Percentage divorced (DIV))

Ethnicity variables. They include race and nationality characteristics:

- Percentage of foreigners (FRN)
- Percentage of Blacks (BLK)
- Percentage from Canada (FCAN)
- Percentage from West European countries (FWE)
- Percentage from USSR (FUSSR)
- Percentage from South and Central American countries (FSACA)
- Percentage from other countries (FOC)

The principal difference in the variables chosen to study the two cities lies in this group of variables. Jacksonville does not have religious data, while Kuwait does not have race data.

Housing characteristics. They include eight variables:

- Percentage owner occupied (OWOC)
- Percentage with persons per unit 1-2 (PPU1-2)
- Percentage with persons per unit 3-4 (PPU3-4)
- Percentage with persons per unit 5-6 (PPU5-6)
- Percentage with persons per unit 7 or more (PPU06)
- Percentage with bedrooms per unit 2 or less (BPU<3)
- Percentage with bedrooms per unit 3-4 (BPU3-4)
- Percentage with bedrooms per unit 5 or more (BPU04)

This set of variables was not used in the case of Kuwait City as was explained earlier in Chapter VI. The final set of variables used for Jacksonville, is found in Table 16. The variables reflect all the four groups.

Data Analysis

The computer program used in the analysis, the method of factor analysis, and the type of rotation were all the same as those used in the analysis of Kuwait City. The analysis produced thirteen factors, each with an eigenvalue greater than 1.0. The thirteen factors explained 77.7 percent of the total variance. However, only five factors, explaining 53.7 percent of the total variance, seemed to be of great importance to the study. In the case of the other eight factors, the factor pattern seems to be of less importance since only one, and in few cases, two variables loaded either weakly or strongly with each factor.

The explanation of the factor loadings will follow the same lines used for Kuwait City with regard to the classification used to describe the strength of each loading. Moreover, the interval used to describe and to map the factor scores in Kuwait City will also be used in Jacksonville.

The Factor Pattern

This section describes the general character of each factor and gives each a name. Also, it describes the

TABLE 16. THE VARIABLES USED IN THE FACTOR ANALYSIS OF JACKSONVILLE.

UNEMP	Percentage unemployed
PRDF	Percentage in professional occupations
MANG	Percentage in managerial occupations
SAL	Percentage in sales
CLRL	Percentage in clerical occupations
TRSP	Percentage in transportation
LABR	Percentage in labor occupations
FRM	Percentage of form workers
SRV	Percentage in services
SCHZ	Percentage with school years completed: 0
SCH1-8	Percentage with school years completed: 1-8
SCH9-12	Percentage with school years completed: 9-12
SCHO12	Percentage with school years completed: Over 12
INC<2000	Percentage with income less than $2,000
INC2-4000	Percentage with income between $2,000 and $4,000
INC4-6000	Percentage with income between $4,000 and $6,000
INC6-8000	Percentage with income between $6,000 and $8,000
INC8-10000	Percentage with income between $8,000 and $10,000
INC10-15000	Percentage with income between $10,000 and $15,000
INC15-25000	Percentage with income between $15,000 and $25,000
INCO25000	Percentage with income over $25,000
A<14	Percentage age less than 14 years
A14-24	Percentage age 14-24 years
A25-44	Percentage age 25-44 years
A45-64	Percentage age 45-64 years
AO64	Percentage age over 64 years
WILF	Percentage of women in labor force
SNG	Percentage single
WID	Percentage widowed
DIV	Percentage divorced
FRN	Percentage of foreigners
BLK	Percentage of Blacks
FCAN	Percentage from Canada
FWE	Percentage from West European countries
FUSSR	Percentage from USSR
FSACA	Percentage from South and Central America
FOC	Percentage from other countries
OWOC	Percentage owner occupied
PPU1-2	Percentage with persons per unit: 1-2
PPU3-4	Percentage with persons per unit: 3-4
PPU5-6	Percentage with persons per unit: 5-6
PPUO6	Percentage with persons per unit: 7 and over
BPU<3	Percentage with bedrooms per unit: 2 or less
BPU3-4	Percentage with bedrooms per unit: 3-4
BPUO4	Percentage with bedrooms per unit: 5 or more

pattern of the spatial structure of the factor scores for each factor. Each of the first five factors is described separately, and the last, less important eight factors are summarized together at the end of this chapter.

Factor I: "Low Middle to Middle Socio-Economic Status"

Factor I explains 23.3 percent of the total variance. Table 17 shows the loadings pattern of this factor. Five variables associate with this factor in loadings over |0.7| and eight variables in loadings over |0.6|. Moreover, there are seven additional variables with a weak relationship (<|0.6| and >|0.4|).

All except one of the strongly related variables are related to the socio-economic group. The exception is related to the FWE variables (0.71235). From the seven weakly related variables, all variables except two reflected socio-economic characteristics: FUSSR (0.50505), and FCAN (0.45355).

Among the variables in the socio-economic group, there is no strong relationship of any of the educational variables with this factor. Further, only one weak relationship reflecting education characteristics is found. This is SCH1-8 (0.40730). Occupational characteristics show four strong associations. There is a negative association between this factor and PROF (-0.66597), and a positive relationship with SAL (0.77310), FRM (0.76813), and SRV (0.83085). There

TABLE 17. MAJOR LOADINGS ON FACTOR I.

PROF	Professional workers	-0.66597
SAL	Sales workers	0.77310
FRM	Farm workers	0.76813
SRV	Service workers	0.83058
MANG	Workers in managerial jobs	(-0.56101)*
CLRL	Clerical workers	(-0.56212)
INC<2000	Income <$2,000	0.66844
INC2-4000	Income between $2,000 and $4,000	0.78044
INC4-6000	Income between $4,000 and $6,000	0.69349
INC15-25000	Income between $15,000 and $25,000	(-0.59959)
INCO25000	Income $25,000 and over	(-0.55119)
SCH1-8	School years completed: 1-8	(0.40730)
FEW	From West-European countries	0.71235
FUSSR	From USSR	(0.50505)
FCAN	From Canada	(0.45155)

*Loadings in parentheses are those with weak relationship.

are two weak, negative relationships with MANG (-0.56101) and CLRL (-0.56212). Income characteristics show three strong relationships. These are INC <2000 (0.66844), INC2-4000 (0.78044), and INC 4-6000 (0.69349). Moreover, there are two negatively associated weak relationships: INC15-25000 (-0.59959) and INCO 25000 (-0.55119).

The general character of these loadings is the positive relationship with relatively lower or middle status jobs and negative relationship with higher status jobs such as professional and managerial occupations. Moreover, there is a positive relationship with low-income variables and a negative relationship with high-income variables. This pattern leads to the labeling of this factor as "Low middle to middle socio-economic status."

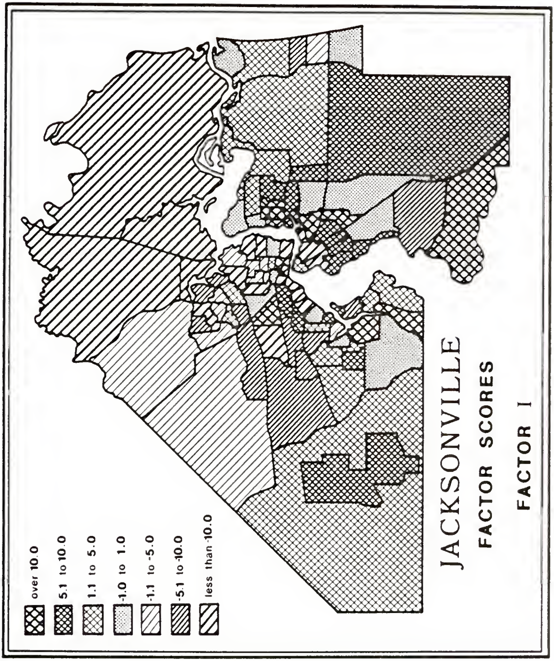
Factor I: Factor Scores

The spatial distribution of the factor scores for this factor shows five distinct patterns (Fig. 13):

1. Low positive factor scores (1.0 to 5.0) mean that the census tracts (CT) show a tendency toward having low socio-economic conditions; but, at the same time, they intermix with other levels of socio-economic characteristics.

There are three trends in the spatial pattern of this group. First, there are two CTs located within the city center. CT 11 is an area with single family units and mostly black residents. This area, adjacent to the central

FIGURE 13. FACTOR SCORES FOR FACTOR I



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FACTOR SCORES

FACTOR I

business district (CBD) of Jacksonville, was influenced by redevelopment action which made it deviate from the general character of this factor. CT 8 is, for the most part, an older residential area. It is a large section redeveloped with large office buildings, hospitals, and hotels which were built in the sections overlooking the river toward the downtown area. The major process, the, which affected the general character of the areas belonging to this group seems to be the redevelopment process.

Second, there are several scattered areas within the suburban communities of Jacksonville which belong to this group. CT 114 and CT 115, located in northwest Jacksonville, are mainly black communities, while CT 123 and CT 126, located in the southwest section of the city, are mainly white communities. The same situation exists in CT 149. The common characteristic among all five areas, as was found during the field work, is that in each area there are several developments of different socio-economic characteristics. For example, one can find some areas with low socio-economic indicators and other areas with middle or low-middle socio-economic indicators, all within one census tract. These indicators include elements such as the condition of the house and its lot, the existence and absence of elements in the house (e.g., two-car garage, single-car garage, or carport), and the condition of the street.

Third, there are several census tracts located on the periphery of the urban area. The common characteristic among these tracts is that they have a mixture of different residential land uses. Because of the very large area of most of these tracts, they have varied residential uses ranging from farm houses, to mobile homes, to single-family units for different levels of socio-economic status, to multifamily structures.

2. High positive factor scores (5.1 to 10.0) reflect a relatively high representation of this factor. The major trend of this group is its concentration in the relatively older residential areas, most of which were new suburbs in the 1960s. This group includes the census tracts directly to the east and to the west of the river. CT 144 is mostly vacant land. The developed areas in this census tract have mostly mobile homes and other types of dwellings unusally considered typical of low and low-middle socio-economic conditions. CT 136 is also a large area, but it is occupied entirely by the U.S. Naval Air Station.

3. Very high positive factor scores (over 10.0) mean a high concentration of this factor. There are four major trends of this group. First, there is a small concentration in the city center area in CT 9 and CT 10. Although most of the areas in these tracts are incorporated in the type of land use found in the commercial area of the downtown, there

are still some areas, especially in CT 10 with older units housing low socio-economic status population.

Second, there are the areas to the east of the river, most of which are small census tracts occupied completely by single-family units, characterized by low-middle status conditions.

Third, there are a few census tracts in the southwestern part of the city where public housing is concentrated in tracts such as CT 133. The existence of low-status housing types is evident in the other areas west of the river.

Fourth, CT 168 is the only very large tract in this group. It is characterized by the existence of a large area of vacant land and by the developed areas primarily having low-status, single-family units and mobile homes.

4. High negative scores (-1.1 to -5.0) are located mainly in the northwestern section of the city. These tracts tend to reflect the characteristics of Factor III, which reflects socio-economic characteristics as well; therefore, they have positive scores as shown in Figure 13. However, three tracts do not follow this pattern. CT 12, CT 13, and CT 15 have negative scores in all socio-economic factors, although the field inspection shows these three as residential areas with low socio-economic conditions. The explanation of this case could be that these three areas could have special conditions that are not explained by the variables that have been used. Each tract contains both a

white and black population and a large section of commercial and light industrial activities. Residential uses range from older single and family units, to multifamily units, and large units which have been converted to multifamily units.

5. Low negative factor scores (-5.1 to -10.0) represent a strong negative deviation from the mean of this factor. All of the tracts with negative scores in this factor, either in this group or in the group -10.1 and less, tend to be positively associated with Factor III, the other socio-economic status factor.

Factor II: "Advanced Family Cycle Stage"

This factor explains 10.9 percent of the total variation. Table 18 shows the loading pattern of this factor. There are two variables which related to this factor with loadings over |0.7| and three variables with loadings over |0.6|. Also, there are three more variables with weak correlations (<|0.6| and >|0.4|).

All of the strong relationships are related to variables reflecting family characteristics. There is a strong positive association between this factor and A45-64 (0.66702), and between this factor and A064 (0.89647). Also, there is a strong positive relationship with WID (0.90511). Moreover, there are two weak loadings: one, negatively related to this factor, is A25-44 (-0.43616), and the other is DIV (0.58975).

TABLE 18. MAJOR LOADINGS ON FACTOR II.

	Clerical workers	(0.53946)*
A25-44	Age 25 to 44	(-0.43616)
A45-64	Age 45-64	0.66702
A064	Age over 64	0.89647
WID	Widowed	0.90511
DIV	Divorced	(0.58975)

*Loadings in parentheses are those with weak relationship.

This pattern of loadings leads to the labeling of this factor as "Advanced family cycle state."

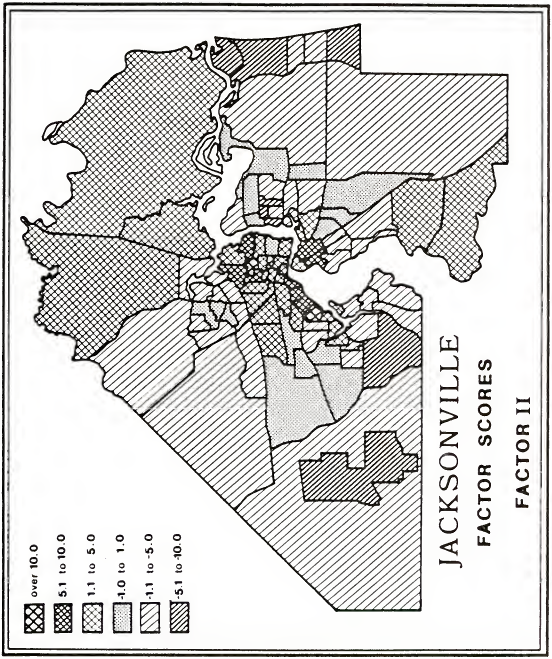
Factor II: Factor Scores

The distribution of the factor scores for this factor shows five distinct patterns (Fig. 14).

1. Low positive factor scores (1.0 to 5.0) show three trends. First, there is a concentration of this factor in the census tracts which form the older suburbs of Jacksonville, especially in the areas of Ortega (CT 24), Lake Shore (CT 124), CT 23, CT 126, CT 26, and Murray Hill (CT 25) and West Jacksonville (CT 27 and CT 118). The second trend is the existence of this group in four of the large census tracts of the city. To the north, this group prevails in the communities located north of Trout River and St. Johns River, which include Dames Point, New Berlin, Polly Towns, San Mateo, and Garden City in CT 101, CT 102, and CT 103. To the south, this group prevails in the community of Goodbys in CT 167 and CT 168.

Third, apart from the area of South Jacksonville (CT 6, CT 7, CT 8) and the areas of CT 167 and CT 168, there is no indication of the existence of this factor anywhere east of the river. Almost all of the rest of these areas are middle-class suburbs which would tend to have a smaller proportion of the population in the advanced stage of the family cycle.

FIGURE 14. FACTOR SCORES FOR FACTOR II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FACTOR SCORES
FACTOR II
over 10.0
5.1 to 10.0
1.1 to 5.0
-1.0 to 1.0
-1.1 to -5.0
-5.1 to -10.0

2. High positive factor scores (5.1 to 10.0) and very high positive factor scores (over 10.0) reflect the highest concentration of the characteristics of this factor. The major trend among all these areas is their location within the older sections of Jacksonville. However, there are three different axes along which these areas developed. First, there is the axis along the western side of St. Johns River, south of the CBD, which includes the areas of Riverside and Avondale (CT 19, CT 20, CT 21, and CT 22). The second axis runs along the eastern side of St. Johns River south of the city center. It includes the areas of St. Nicholas (CT 6) and Colonial Manor (CT 7). The third axis runs to the north of the CBD along main streets northward to Trout River.

3. High negative factor scores (-1.1 to -5.0) indicate the absence of this factor from the areas belonging to this group. Figure 14 shows that these areas dominate most of the suburban communities in all directions. It also shows the absence of this group in the older, more central parts of the city.

4. Low negative factor scores (-5.1 to -10.0) reflect a strong deviation from average behavior of this factor. Two major patterns can be identified in this group. First, these areas may include residential areas associated with families in earlier stages of the family cycle such as in the case of Wesconnett (CT 135), South Arlington Hills, and

River Forest (CT 151, CT 152, and CT 153). Most of these tracts score high on Factor IV (early stage of family cycle) as shown in a comparison Figure 11 and Figure 13.

The second pattern includes areas with special use, such as the U.S. Naval Air Station in CT 136 and the Mayport Naval Station in CT 139. The nature of this use makes an older population structure unlikely.

Factor III: "Middle to High Middle Socio-Economic Status"

This factor explains 8.0 percent of the total variance. Table 19 shows the loadings pattern of this factor. There are four variables with loadings over |0.7|, and only one weak loading (<|0.6| and >|0.4|). All of the loadings in Table 19 except one are variables related to socio-economic characteristics. The exception is related to the variable A <14 (0.76972).

Within the socio-economic group, two variables of occupational status are strongly related with this factor. These are TRSP (0.77938), and LABR (0.82554). Moreover, there is one variable positively related to income characteristics, INC6-8000 (0.72226). There is one weak positive loading related to this variable: INCO25000 (0.42325). The general pattern of these loadings shows a status range from low middle socio-economic status to high middle socio-economic status. The major difference between this factor and Factor I, which also reflected low socio-economic

TABLE 19. MAJOR LOADINGS IN FACTOR III.

TRSP	Transportation workers	0.77938
LABR	Labor workers	0.82554
INC6-8000	Income between \$6,000 and \$8,000	0.72226
INC025000	Income \$25,000 and over	(0.42325)*
A<14	Age less than 14 years	0.76972

*Loadings in parentheses are those with weak relationship.

conditions, is in income, for the areas in Factor III show somewhat better income. Therefore, this factor is labeled "Middle to High Middle Socio-Economic Status."

The occupational characteristic is of low-status type, and the family characteristic is of positive high loading in A <14 which also is related to low socio-economic conditions.

The weak loading for the variable INCO25000 is considered too weak to change the general pattern of this factor.

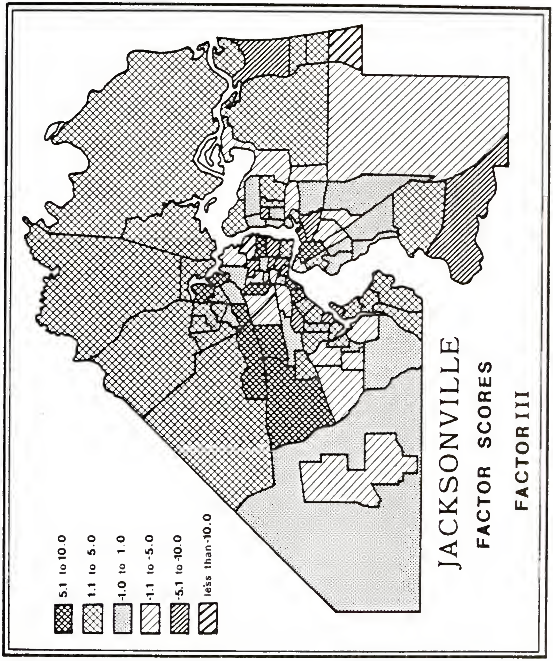
Factor III: Factor Scores

The distribution of the factor scores for this factor and the comparison of Figure 15 with Figure 10 shows that the factor scores of Factor III cover the areas which had negative scores for Factor I. These factor scores show four main spatial patterns.

1. Low positive scores (1.0 to 5.0) illustrate two major trends. First, this group tends to exist in all directions of the city in a sectoral pattern. Two major sectors can be identified. One sector is to the south of the central district and the other sector is toward the northeast. The second trend of this group has a tendency to have a peripheral location if it is compared with the next group (5.1 to 10.0).

2. High positive factor scores (5.1 to 10.0) reflect a relatively high representation of Factor III. There are

FIGURE 15. FACTOR SCORES FOR FACTOR III


5.1 to 10.0
1.1 to 5.0
-1.0 to 1.0
-1.1 to -5.0
-5.1 to -10.0
less than -10.0
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FACTOR SCORES
FACTOR III

two sectors along which this factor tends to exist. One is a long sector stretching westward from the GBD, and the other is a short sector stretching toward the northwest, but which tends to be located toward the city center.

3. Negative factor scores (less than -1.0) are found for tracts in two major sectors. The first sector tends to have a southeastern direction, and the second sector tends to have a southwesterly orientation from the city center. However, if Figure 15 is compared with Figure 13 for Factor I, it will be noticed that the areas in these two sectors score positively and strongly with Factor I.

Factor IV: "Advanced Family Cycle Stage"

Factor IV explains 6.5 percent of the total variance. Table 20 shows the loadings pattern of this factor. There are two variables related to this factor with loadings over $|0.7|$ and only one weak loading ($<|0.6|$ and $>|0.4|$).

The strong loadings are positively related to family characteristics. Contrary to Factor II, which was characterized by an advanced family cycle stage, this factor provides high loadings reflecting the early stage of the family cycle. It is characterized by the concentration of persons in A14-24 (0.91981) and SNG (0.94987). With these two characteristics, this factor can be labeled "Early Stage in the Family Cycle."

The only weak loading on this factor is a socio-economic variable. It reflects a slight tendency toward

TABLE 20. MAJOR LOADINGS ON FACTOR IV.

A14-24	Age 14-24 years	0.91981
SNG	Single	0.94987
INC6-8000	Income between $6,000 and $8,000	(0.40218)*

*Loadings in parentheses are those with weak relationship.

middle-income status, $6,000-$8,000 (0.40218). Again, the loading is too weak to change the general character of this factor.

Factor IV: Factor Scores

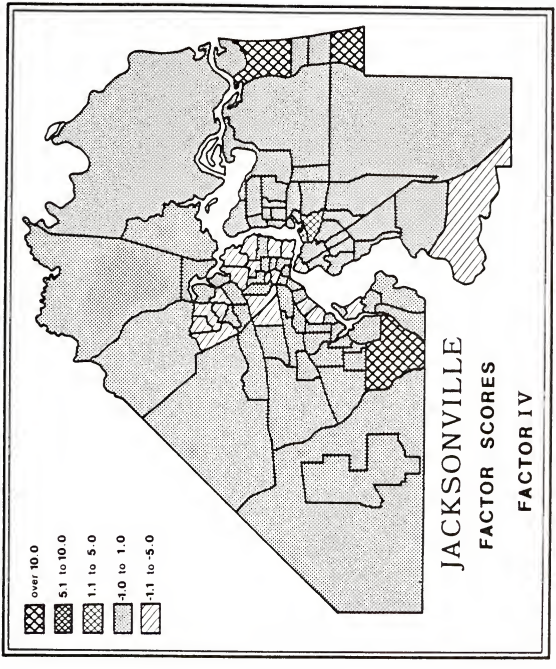
The distribution of the factor scores for this factor shows three major trends (Fig. 16).

1. Low positive scores (1.0 to 5.0) have a unique spatial pattern. This group concentrates in only two census tracts, CT 156 and CT 157. These two tracts show positive scores in Factor I. The field inspection corroborated the data showing that these areas have middle or high middle socio-economic characteristics and single-family units.

2. Very high positive scores (over 10.0) mean that there is a high concentration of population now in the early stage of the life cycle. As shown in Figure 16, these areas are scattered in different parts of the city. Each area shows distinctive characteristics. CT 135 is mainly a suburban, single-family-unit area. CT 139 includes Mayport Naval Air Station, so a high concentration of early family cycle stage can be expected. CT 142 is a beach area south of Jacksonville Beach, with the least clear reasons for this high deviation. The last area in this group is in CT 152 which is located very close to the Jacksonville University Campus.

3. High negative factor scores (-1.1 to -5.0) show two spatial trends. The first trend is found in a group

FIGURE 16. FACTOR SCORES FOR FACTOR IV


JACKSONVILLE
FACTOR SCORES
FACTOR IV
over 10.0
5.1 to 10.0
1.1 to 5.0
-1.0 to 1.0
-1.1 to -5.0

around and close to the city center. The second trend is found in a few tracts located farther from the city center. In both cases, these negative scores were negatively deviated from the mean in Factor II.

Factor V: "Housing Characteristics"

Factor V explains 5.0 percent of the total variance. Table 21 shows the loadings pattern of this factor. There are three variables which correlate with this factor in loadings over |0.7|, and there are two variables with weak correlations (<|0.6| and >|0.4|).

All the loadings, the strong and the weak, relate to variables from the fourth group, which represents housing characteristics. From the bedrooms-per-unit group, there is a tendency to have medium-size units with 2 bedrooms per unit (0.74870). The same tendency is noticed with regard to the persons-per-unit group. There is a tendency toward medium-size units with two variables highly loaded in this factor: PPU3-4 (73801) and PPU5-6 (0.78437). In addition, the two weak loadings which relate to this group were PPU1-2 (0.53328) and PPU06 (0.57555).

This pattern of loadings leads to labeling this factor "Housing Characteristics."

Factor V: Factor Scores

The distribution of the factor scores for this factor shows four distinct patterns (Fig. 17).

TABLE 21. MAJOR LOADINGS ON FACTOR V.

BPU<3	Bedrooms per unit: 2 or less	0.74870
PPU1-2	Persons per unit: 1-2	(0.53328)*
PPU3-4	Persons per unit: 3-4	(0.73801)
PPU5-6	Persons per unit: 5-6	0.78431
PPU06	Persons per unit: 7 and over	(0.57555)

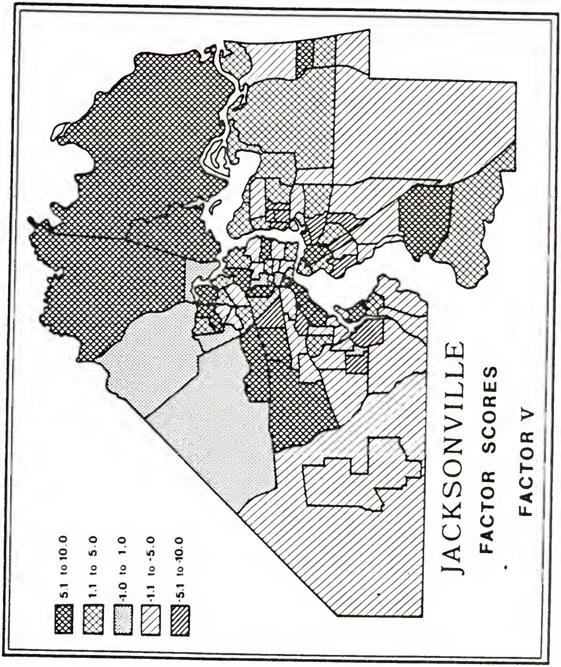
*Loadings in parentheses are those with weak relationships.

1. Low positive factor scores (1.0 to 5.0) include several census tracts. Some of these tracts, such as CT 143, CT 146, CT 138, and CT 168, have areas of mobile-home parks, small single-family units, and apartment buildings which conform to the general character of this factor. However, because these census tracts are relatively large, they also contain other types of residential uses, which gives a low positive deviation character to these areas.

Other areas belonging to this group concentrates in or near the city center. These areas contain units which were originally built as large units and were later divided into smaller units.

2. High positive factor scores (5.1 to 10.0) are concentrated mainly in the western section of the city. There are three trends that can be identified in this group. First, there is a concentration of this factor in the areas which showed high deviation with regard to Factor II (Advanced Family Cycle State). The second trend is the concentration of this factor to the north of the city center. Most of these areas are occupied by low socioeconomic status blacks. The third trend is the concentration of this factor in other suburban areas, which primarily contain areas with mobile-home communities and low socioeconomic status populations. This includes CT 118, CT 119, CT 167, CT 101, CT 102, and CT 103.

FIGURE 17. FACTOR SCORES FOR FACTOR V


5.1 to 10.0
1.1 to 5.0
-1.0 to 1.0
-1.1 to -5.0
-5.1 to -10.0
JACKSONVILLE
FACTOR SCORES
FACTOR V

3. High negative factor scores (-1.0 to -5.0) correspond mainly to the areas with middle or higher socio-economic characteristics. The size of the housing units is larger and the size of the household is smaller. Moreover, it includes areas which have special types of uses such as the Naval Air Stations.

4. Low negative factor scores (-5.1 to -10.0) mean a strong deviation from the mean of this factor. As illustrated in Figure 17, the tracts in which this group prevails are small in size. Moreover, they house principally middle socio-economic status families. The small size of these areas reduced the chances of having mixed usage as is the case in most of the other large tracts.

Factors VI-XIII

The analysis of individual factors was stopped at Factor V because the rest of the factors were not significant in the percentage of variance explained (over 5 percent), as shown in Table 22. However, this section will explain has only one high loading which is SCH012 (0.78827). Moreover, this factor relates weakly to the variable INC8-10000 (0.56208). This pattern leads to labeling this factor "Middle Class Population."

Factor VII has two strong loadings, one with the variable FRN (0.69250), and the other is with the variable FOC (0.82724). There are two variables related weakly to

TABLE 22. SUMMARY OF THE MAJOR LOADINGS AND PERCENT OF VARIANCE EXPLAINED BY FACTORS VI-XIII.

Variables		Loading	Percentage of Variable Explained
Factor VI			
SCH>12	School > 12 years	0.78827	3.9
Factor VII			
FRN	Foreigners	0.69250	
FOC	From other countries	0.82724	3.5
Factor VIII			
UNEMP	Unemployed	-.75473	
INC10-15000	Income between $10,000 and $15,000	0.62571	3.4
Factor IX			
SCHZ	Schooling zero	0.63557	
SCH9-12	Schooling: 9-12 years	0.66183	3.0
Factor X			
OWOC	Owner occupied	0.78811	2.8
Factor XI			
FSACA	From South and Central America	0.70954	2.6
Factor XII			
A25-44	Age 25-44 years	0.81693	
BLK	Blacks	0.77911	2.5
Factor XIII			
WILF	Women in labor force	0.68763	
BPU3-4	Bedrooms per unit: 3-4	0.65982	2.3

this factor. One is A45-46 (0.44421) and the other is INC <2000 (0.47086). Although this factor explains only 3.5 percent of the total variance, it has variables from three groups. This may reflect the inconsistent organization of status in the areas of this factor. However, the major loadings are related to the ethnicity group; therefore, this factor could be called "Mixed Foreign Population."

Factor VIII also has two high loadings, one with the variable UNEMP (0.75473), and the other with the variable INC10000-15000 (0.62571).

Factor IX has two high loadings. One is SCHZ (0.63557), and the other is SCH9-12 (0.66183).

Factor XI also has one strong loading only. This is FSACA (0.70954). There are two variables weakly related to this factor. Both variables are from the housing characteristics group. One is BPUO4 (-0.47942), and the other is PPU1-2 (0.45067).

Factor XII has two variables strongly related to this factor. One is A25-44 (0.81693), and the other is BLK (0.81693). There are two variables weakly related to this factor. One is DIV (0.56505) and the other is MANG (0.58291). This mixture of variables shown in the black factor reflects the pattern of the southern cities which contain a large proportion of black population.

Factor XIII has two high loadings. One is related to WILF (0.68763) and the other to BPU3-4 (0.65982).

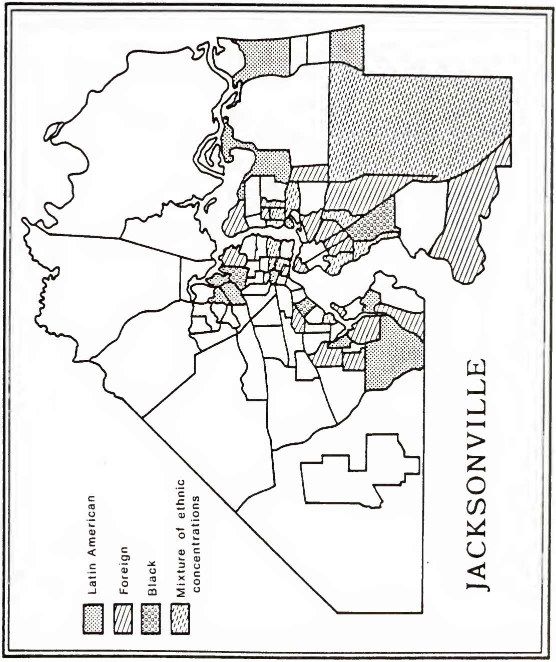
Figure 18 shows the distribution of factor scores for the three ethnic factors. It is noted that there is some clustering of these groups. Blacks tend to be concentrated toward the city center along with the mixture group which is largely blacks. The foreign population tends to be located farther from the center, and the Latin American population is sometimes located in distant suburbs.

Summary and Conclusions

The analysis showed a rather strong tendency toward the separation of the major dimensions found in the study of the factorial ecology of North American cities. These dimensions can be summarized in the following points.

1. These are two major dimensions related to the socio-economic status. Although there are some correlations between these two factors and some variables of other types of characteristics, the strong association with the socio-economic variables causes them to be unaffected by such correlations. Factor I was found to have variables reflecting low to middle socio-economic status. In this factor income tends to be in the category less than $6,000. Occupations tend to be of lower socio-economic status, such as farming, sales, and services. The education variables, although not strong, also reflect this tendency (Table 16).

FIGURE 18. THE DISTRIBUTION OF POSITIVE FACTOR SCORES (OVER 1.0) FOR FACTORS VII, XI, AND XII


Latin American
Foreign
Black
Mixture of ethnic concentrations
JACKSONVILLE

Factor III, on the other hand, is not easy to define because of the appearance of unexpected, somewhat contradictory variables. It shows occupational variables related to lower-status occupations, yet income categories show a tendency toward higher levels. This situation was explained as being the result of large areas in some CTs which led to the existence of a mixture of residential uses and types. Therefore, this factor was labeled "Middle to High Middle Socio-Economic Status."

2. There are two factors reflecting family characteristics. Factor II explained family characteristics in an advanced stage where the correlation is with variables reflecting older age groups and percentage widowed. Factor IV, by contrast, has variables reflecting the early stage of the family cycle.

3. There is one important factor which is related to the housing conditions. It mainly reflects characteristics of medium-housing conditions with regard to persons per unit and bedrooms per unit.

4. Surprisingly, there was no factor reflecting ethnic conditions among the five major factors. However, ethnicity is found in the factorial ecology of Jacksonville, especially in Factor VII which is related to foreign population, in Factor XI which is related to Latin American population and in Factor XII which is related to black population.

The spatial pattern of each factor shows a general conformity with the model of the North American cities. This pattern can be summarized in the following points.

1. The two socio-economic factors spread sectorally from the city center. Factor I has two sectors: one spreads to the southeast and the other to the southwest. Factor III has three sectors, one spreading to the northeast, the second to the northwest, and the third to the south of the city center.

2. The two family status factors show a concentric pattern with Factor II, having the highest scores in the central part of the city and going down with outward progression from the center (Fig. 11). Factor IV, on the other hand, tends to have the lowest scores in the central parts and higher scores with outward progression toward the edge of the city.

3. Because the number of variables used in the housing groups is relatively small, there is only one important factor related to the housing characteristics. The distribution of the factor scores of this factor follow, to some degree, the distribution of scores for the socio-economic status. There are three major sectors related to this factor: a northern and a southwestern sector with high positive factor scores, and an eastern sector with low positive factor scores.

CHAPTER VIII
CONCLUSIONS

The literature of factorial ecology reveals differences in factorial ecology of urban areas in different parts of the world. These models were summarized in Chapter II. The development of these models was identified in two periods; the traditional "classical" period, and the factorial ecology period. The traditional period goes back to the work of Park in 1916 who introduced the concepts of analogy between the processes that produce the human organization and the ecological theories in plant and animal studies. This period extends to the middle of the century during which three major models were developed. These models are the concentric-zone model, the sector model, and the multiple-nuclei model.

The factorial ecology period was characterized by the introduction of new models of urban ecology in which the models of the traditional period were integrated. The contemporary urban ecology has two trends. One is a theoretical trend represented by the social area analysis theory. Three predetermined components form the social area theory. These components are social rank, familism (or urbanization) and segregation.

The other trend of contemporary urban ecology is the trend known as factorial ecology. Unlike the social area theory, the number of variables included in the analysis using this method is not limited, and the analysis is inductive not deductive. The components resulting from the factorial ecology method can be placed in five groups. These groups are: socio-economic status, familism, segregation, mobility, and housing.

The empirical results of testing these two main models in previous studies are outlined in the rest of Chapter II. These results can be put into two major groups. First, the Western-city model which revealed a general similarity of factor structure, except in the case of ethnicity and segregation where some differences can be noticed. The resulting factors in this group were labeled socio-economic status, familism, ethnicity, mobility, and housing. More factors were produced in most of the case studies, but these factors reflected locally unique conditions.

The four models in this group are:

1. The North American model. This model reflects all five major components of the Western city. This was the case in all the studies on cities of the United States and Canada.

2. The European model. At least two of the three major components of the Western city show in this model. These two components are socio-economic status and

familism. The third dimension is missing because of the smaller number of persons in ethnic categories in comparison with those in North American cities.

3. The British model. This model was separated from the European model because of the differences in the urban ecology resulting from the influence of the public sector. This influence produced the same dimensions as in the North American model, but the spatial structure of each dimension is different.

4. The Australian city model. This showed great similarity to the North American city model.

Second, the non-Western city model which varies in accordance with the level of economic and industrial status of each country. In countries with relatively well-developed economies, reflecting a somewhat advanced industrialization status, there is a greater tendency toward having separated groups and a factorial structure approaching that of the Western City. By contrast, cities in the early phase of the development process tend to have a factorial structure which does not discriminate among the major components found in the Western city.

In Chapter III an attempt to outline the major urban ecological characteristics of the contemporary Arabian city was made. Because of the lack of studies using the factorial ecology approach, more emphasis was put on reviewing other studies on urban structure. However, the three studies available on the factorial ecology of three Arabian cities showed consistency with the model of the non-Western city model.

Three research hypotheses, stated in Chapter V, were derived from the review of the literature on the factorial ecology of both the Western and the non-Western cities in Chapters II and III. Following the analysis of data on Kuwait City and Jacksonville in Chapters VI and VII, these conclusions can be drawn.

Hypothesis I was intended to demonstrate the relationship between the actual factorial structure of the two study areas, Kuwait City and Jacksonville, within the available findings on the non-Western and Western cities. The results of the analysis showed that the factorial ecology of Kuwait City conforms to the general character of the non-Western city. There is no separation among the three major groups of variables. There are always at least two groups with high loadings in each component.

Jacksonville, on the other hand, showed a strong tendency toward the separation of the major dimensions found in the North American model. Of the first five factors, two are related to socio-economic characteristics, two are related to family characteristics, and one is related to housing characteristics. Surprisingly, there were no strong factors on ethnic conditions. However, there were three somewhat weak factors related to countries of origin and to racial characteristics. This situation may be related to the historical pattern of immigration of Europeans to northern cities and to the movement of Blacks to those cities. In both movements each ethnic group lived in separate areas from each other. This migration pattern was not clear in southern cities.

Hypothesis II posed a question of how far the residential structure of Kuwait City is from the Western city model represented by Jacksonville. The conclusions drawn by comparing the resulting factorial structure of Kuwait City and Jacksonville, and the result of examining the first hypothesis reveal that Kuwait City strongly reflects the traditional residential structure of non-Western cities since, in these cities, it is hard to find a separation among the major components of the factorial ecology models.

Hypothesis III provided for an examination of general dimensions of the residential structure of both Kuwait City and Jacksonville, as well as the spatial patterns of the main factors in both cities. Comparison of the most important ones for each city showed strong dissimilarities. In Kuwait City, where the major factors explained 72.9 percent of the total variance, two factors explain the pattern of residential differentiation. One factor reflects low socio-economic status, and the other reflects higher socio-economic status. The low socio-economic status factor explained the highest proportion of variance (27.6 percent) and contained variables from the three major groups. From the socio-economic group there are high positive correlations with variables indicating low educational attainment and negative association with the medium levels of education. The same tendency was found in the occupation characteristics where there is strong positive association with occupations of low socio-economic status such as labor occupations and agriculture occupations. Mostly weak loadings were produced from the other two groups.

The second factor explained 20.8 percent of the variance and reflected, for the most part, a higher socio-economic status. From the socio-economic variable group there is a strong negative relationship with low educational attainment and strong positive association with very high educational attainment. The same trend is found in the occupation variables where there is strong association with technical and managerial occupations. The same condition is presented with regard to the variables from the family group. There is strong positive association with variables such as female employment, and with fewer people in the very young and very old age groups. The ethnicity group variables also indicate some higher socio-economic status. There is strong positive association with persons from European and American countries.

The remaining major factors in Kuwait seem to be related to the special cases of foreign population structure. The third factor explains 13.7 percent of the total variance and relates to the Jordanians, Palestinians, and Lebanese. The fourth factor explains 6.7 percent of the variance and indicates medium status foreign population. From the socio-economic group there is only one strong loading--sales occupation. From the ethnicity group, several variables reflect ethnic and religious characteristics. There is a concentration of persons from South Yeman, Pakistan, and India, in addition to some non-Muslim groups. Finally, the fifth factor explains 5.4 percent of the total variance and relates to low socio-economic status foreign population. It has a low socio-economic status because of the concentration of laborers and low-status occupations, and is foreign because of the strong relationship to the population from Iran and Iraq.

The major factors for Jacksonville explained 53.7 percent of the total variable. They included three or four expected groups of factors. The first factor explained 23.3 percent of the total variance, and it reflects low socio-economic characteristics. It shows a strong association with low-status occupations, such as as farming or service jobs while it has a strong negative relationship with high status occupations, such as professional and managerial jobs. Income variables also reflect this trend of the first factor. There is a strong association with variables reflecting very low to low-medium income conditions, and it is negatively related to high-income variables.

The second factor explains 10.9 percent of the total variance, with an advanced family cycle characteristic. There is a strong positive association with age groups of older population, while the age groups of younger population show a strong negative relationship.

The third factor explained 8.0 percent of the total variance, reflecting socio-economic status characteristics. The nature of this factor is not very clear as the variables of occupation characteristics show low-status occupations such as transportation workers and laborers. By contrast, the income variables show middle- to high-status conditions.

The fourth factor explains 6.5 percent of the total variance, with variables indicating an early stage in the family cycle. There is a very strong positive association with the age group of young population and the variable of single population.

The fifth factor explained 5.0 percent of the total variance. It contained variables on housing characteristics.

There was no factor of ethnic structure among the most important factors. However, three of the remaining eight factors relate to ethnic conditions. Factor VII reflects general foreign population characteristics, Factor XI reflects South American population characteristics, and Factor XII indicates a black population. Each of these three factors explains less than 3.5 percent of the total variance.

The dissimilarities in the factorial ecology structure of the two cities are also presented in the spatial pattern of each factor. Kuwait City shows three main patterns. First, there are two areas of mixed low- and high-economic status population. One area includes the old city, and the other area includes the older suburbs. Second, high economic status areas are located in the modern suburbs. Finally, there are low-economic status suburbs which include the areas for low-income families, newly built through interest-free loans.

The spatial pattern of factor scores for Jacksonville shows three major trends. First, the socio-economic factors spread sectorally from the city center. Second, the two family-status factors show a concentric pattern with small families tending to concentrate toward the city center, and larger families tending to be located outward from the city center. Finally, the factor scores for the housing factor showed a pattern related to the pattern of the socio-economic status factors. All three trends in general, and the first two in particular, conform to the findings in other North American cities and to the model of the Western city.

The findings of this study add additional insight into the relatively well-established model of the factorial ecology of the Western city and to the under-construction model of the non-Western city.

Future comparative research on the non-Western city is still needed in many aspects of factorial ecology. The problem of availability, quality, and comparability of data seems to be improving, opening more doors toward this goal. One of the more needed studies at present is that of comparing urban ecologies among non-Western cities; however, we should consider the differences among the regions of the non-Western countries such as differences found in Western cities and the identification of the regional models of North America, Britain, and continental Europe. Non-Western regions may include areas such as South Asia, East Asia, Africa, and Latin America.

In addition, there is still an unclear definition of the conceptual framework that explains the relationship between the level of modernization and the pattern of ecological structure.

The rates and means of development differ among the non-Western countries. This is strongly reflected in the pattern of growth and change of the urban structure. More comparative studies are needed with countries or groups of countries experiencing similar conditions in order to support the planning processes in those countries. For example, within the Middle-Eastern countries, one can differentiate between oil-rich countries and other countries. Each group might be considered as a separate area of factorial ecological examination.

Small towns are neglected in the factorial ecology literature on both Western and non-Western cities. This situation can be considered as another area for future research in factorial ecology. Some urban ecological problems, such as crime, poverty, and other urban problems in the non-Western city should also be considered in future studies.

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BIOGRAPHICAL SKETCH

Khalid Al-Ankary was born February 10, 1951, in Jeddah, Saudi Arabia. He graduated from al-Shati High School, Jeddah, Saudi Arabia, in 1969. Between 1969 and 1973 he attended the undergraduate program in Geography at the University of Riyadh, Riyadh, Saudi Arabia. After receiving his Bachelor of Arts in June, 1973, he worked as a teaching assistant in the Department of Geography, University of Riyadh, until June, 1974. In 1975 Mr. Al-Ankary attended the graduate program in Geography at the University of Oregon where he received a Master of Arts in June, 1977. In January, 1978, he enrolled in the Ph.D. program in Geography at the University of Florida.

Khalid Al-Ankary is married to Moudi Ibrahim, and is the father of one son and three daughters.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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